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ABSTRACT

Intended for use by teachers of health sciences at all levels, by health administrators with staff supervision responsibilities, and by students, this fourth edition (a reprint of the 1976 edition with only minor editorial changes) is intended to help readers acquire three skills: to define the educational objectives of professional training programs; to plan a learning curriculum; and to evaluate the objectives achieved by constructing tests and other measurement devices. These goals constitute the subject matter of the first four chapters. Chapter 5, How to Organize a Short Educational Workshop, provides a systematic approach to educational problems and uses the following education principles: (1) allowing the participant to prepare and select his objectives in order to increase his motivation; (2) giving the participant an active role in his teaching to increase its effectiveness; and (3) providing the participant with regular opportunities for self-evaluation to increase his learning speed and improve the quality of his knowledge and skills. Each chapter contains a list of learning objectives covering its content, and tests and exercises are interspersed throughout the theoretical text pages. Key pages of text and charts are printed in extra large type so that they can be made into transparencies for overhead projection. Also included are a pretest and posttest, a glossary index of terms, and a bibliography. (ELG)

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FOR REVIEW
POUR ANALYSE

WHO Offset Publication No. 35

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# Educational HANDBOOK for HEALTH PERSONNEL

J.-J. GUILBERT

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CE 014 155

WORLD HEALTH ORGANIZATION GENEVA, 1977

# EDUCATIONAL HANDBOOK FOR HEALTH PERSONNEL

J.-J. GUILBERT

WORLD HEALTH ORGANIZATION
GENEVA
1977

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*WHO Offset Publication No. 35*

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PRINTED IN SWITZERLAND

# EDUCATIONAL HANDBOOK
# FOR
# HEALTH PERSONNEL

PAGES 5, 6, AND 7 HAVE BEEN REMOVED AND ARE NOT INCLUDED IN THE PAGE COUNT.

## OBJECTIVES OF THE HANDBOOK

1 TO HELP THE READERS TO ACQUIRE THE SKILLS OF ⇨

(a) stating educational objectives in behavioural terms:

(b) planning a curriculum and selecting learning activities:

(c) constructing tests and other measurement devices.

2 These skills will be based upon measurable gain of knowledge concerning: ⇨

(a) relationship between professional training programmes and subsequent practice:

(b) principles of learning and role of the teacher:

(c) role of objectives in educational planning:

(d) principles and methods of curriculum planning:

(e) principles and practices of educational evaluation.

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*

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*

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## Preface to the fourth edition

This fourth edition (1977) is a reprint of the 1976 edition with minor editorial changes. It was a collective work which took into account the critical comments and suggestions of numerous users of the first editions.

The first edition was prepared on the basis of documents distributed during a workshop organized by the Regional Office for Africa, Brazzaville, in December 1969 with the assistance of consultants in medical education.[1] It was revised in May 1971 and has been widely used in the Region and served as a basic document for many educational planning workshops.

It then became evident that it would be useful to give the reader better guidance during his progression through the whole educational planning cycle. Although this objective would most likely be achieved by a completely programmed presentation it seemed that the complexity of the problems involved was not great enough to justify a method which would be so intricate and long to prepare. Only practice could say whether this was correct. In 1975 a fully revised text was field tested and led to the 1976 revision distributed in over 10 000 copies in four languages.

A list of objectives (yellow pages) is indicated for each chapter so as to give the reader an idea of what he can learn from it. To help him discover whether he has increased his knowledge, exercises are included throughout the Handbook (blue pages).

The theoretical content takes the form of original documents or short excerpts (white pages) from works included in the list of references (page 615).

Certain pages are printed in large characters so that they can easily be made into transparencies for overhead projections (for technique, see page 218).

This new edition will, in turn, be revised in the light of suggestions we hope to receive from users. If you would like information or explanations, do not hesitate to write to:

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To order copies please see list of addresses on back cover.

---

[1] Dr S. Abrahamson and Dr H. Peterson (USC, Dept. Med. Educ., Los Angeles).

## FOR WHOM

## is this Educational Handbook intended?

Originally, in 1969, the first edition was written for teachers of the health sciences. Subsequently, however, the Handbook was used above all by hundreds of participants in meetings organized by, or with the assistance of, WHO (educational planning workshops, teaching methodology seminars, etc....).

A recent survey covering 200 users revealed the following opinions.

A very small minority (10%) felt that the Handbook should be supplied only to participants in controlled educational activities (workshops, seminars, courses, etc.) or reserved for "teachers of teachers".

The majority felt, however, that dissemination should be as wide as possible, and be directed to all teachers of health sciences at all levels, health administrators with staff supervision responsibilities, and to students, so as to help them to draw the maximum benefit from their learning activities and help them to participate in their organization.

Although it appears to be proved that the use of the Handbook is made easier by participation in an introductory meeting, nevertheless a motivated individual reader would seem to be able to derive great advantage from it.

* * *

THIS HANDBOOK'S PRESENTATION IS UNUSUAL. ONE WEEK BEFORE GOING TO PRESS I WAS ADVISED BY A DISTINGUISHED EDUCATOR WHOM I TRUST TO SAY A FEW WORDS ABOUT THIS UNUSUAL CONSTRUCTION. I TRIED.....AND DID NOT FIND THOSE WORDS..... THIS UNUSUAL PRESENTATION MAY IRRITATE YOU AND COMPLICATE YOUR WORK UNTIL YOU GET USED TO THE WAY THIS HANDBOOK HAS BEEN PUT TOGETHER. THERE MUST BE A REASON FOR IT...EVEN IF I DO NOT KNOW IT....

J.-J.G.

* * *

# INTRODUCTION

Educational problems have been a source of concern for many years to those training health personnel and the alarm has often been sounded. However, the strength of the traditions impeding the necessary reforms has been such that it has not been possible to avoid serious disorders in numerous universities throughout the world, disorders which have always been caused by a reaction in face of the apparent diehard conservatism of the system.

It would, however, be negative and dangerous merely to accuse of incompetence those at present in positions of teaching responsibility. They should be offered aid.

Societies change and have always been changing, but until the present century their evolution was relatively slow and adaptation to change was possible without unduly violent disorders.

However, the form of teaching has for centuries past been a repetition of itself. The university has wrapped itself in its privileges and remained deaf to the cry from without. The needs of society, the practical side of the matter, have been left to chance. The specific features of the situation in each country are changing ever more rapidly, but higherto, unfortunately, little or no account has been taken of those features and the training of health personnel has copied the traditional systems utilized in the past. What is now required is to make sure that educational programmes are relevant.

There can be no question of continuing to copy the models of the past or, in the case of developing countries, foreign models.

The educational system leading to the development of health personnel, at all levels, must be re-examined within the context of the needs of the country concerned.[1]

No educational system can be effective unless its purposes are clearly defined. The members of the health team must be trained specifically for the tasks they will have to perform, taking into account the circumstances under which they will work.

These tasks can only be defined in accordance with a plan in which the nature of the services to be provided is specified, priorities are allotted, the staff needed to provide these services determined, etc....

Professional training programmes must then be tailored to meet these needs (see diagram, page 114).

There is room for some degree of optimism in this sphere, for in order to move in the right direction, it is not necessary to obtain financial assistance but only to use a resource distributed in more or less equal quantity throughout the world: mental ability. The management of that resource is the art of organizing talent and of coping intelligently with change.

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[1] The study of needs, organization of health services, and definition of tasks and functions are, however, not dealt with in this Handbook. Consequently, specialized texts should be consulted concerning those aspects (see references, p. 615).

A sum of knowledge exists in the matter of management, planning and education which could assist the teaching staff of existing or future health science centres as well as health administrators with training responsibilities.

Defining the educational objectives of training centres is of crucial importance.

Thus an educational programme, instead of being the result of a non-selective accumulation of knowledge built up over the centuries, must be shaped selectively in terms of the goal to be achieved. If that goal is modified in the course of time, the programme, too, must be modified accordingly.

The educational objectives must proceed from a prospective study of requirements and possibilities and be based on the definition of the tasks the various types of personnel will have to carry out during their professional career in a given type of health service.

If we stress the importance of the prior definition of health activities (services), it is because it is a prerequisite for any definition of educational objectives (see diagram, p. 114). Indeed, if educational objectives are based on faulty principles, then the "best" system of training may well give "bad" results, for there is a danger that a "bad" message will be "better" communicated, and this is certainly not the goal sought.

Educational objectives should be defined by using behavioural terms corresponding to the tasks to be accomplished. In other words, the definition must indicate what the graduates of a given school will be able to DO at the end of their period of education or training that they were not able to do before. By means of an evaluation system it can be determined whether these objectives have been achieved.

Even though the idea of clearly defining the objectives of a professional training programme seems to be a simple one, it is, in fact, a rather difficult task.

If the teaching staff are given an opportunity to gain the new knowledge they need and to acquire the appropriate modern teaching skills, they will feel more secure and, instead of being confined to limited personal experience, they will accept the use of more formal educational research methods.

Such findings can be powerful stimuli to institutional change, particularly when used by faculty members whose experience in the educational process has already alerted them to the ways in which educational innovation can be accomplished with the largest measure of faculty enthusiasm and the smallest measure of faculty hostility. Such innovation, based upon carefully gathered information and developed on sound educational principles, may allow some of the medical education institutions to explore, in particular, non-traditional means of preparing the members of the health team for the professional task they must undertake. Without the incrusted educational tradition that long adherence to a single system creates, the opportunity for innovative experimentation is far greater.

This is a very difficult task which may well have daunted the most conscientious. We consider that assistance in this field should be given to teachers.

That is the main reason why this Handbook has been prepared and used during workshops on educational planning.

★ ★ ★

It should be stressed at this point that the approaches suggested in this document are the result of a deliberate choice by the author and reflect his ideas in the field of education. Various theories sometimes regarded as contradictory are explained to the reader so as to give him food for reflection, rather than to subject him to any philosophical constraint. It is for the reader to make his choice, to draw initial conclusions, and, in particular, to seek solutions for his own teaching problems by utilizing those of the various theoretical approaches suggested which warrant such use. Wholesale rejection of them would hardly be constructive; it would be preferable to propose better ones.

J.-J.G.

## ATTENTION!

Would you like to find out how much you know BEFORE studying the rest of the Handbook?

One way of doing this is to try to answer the questions in a PRE-TEST.★

To do so, read straight away the questions on pages 167 to 170, 269 to 271, 344 to 346 and 479 to 482 and enter your answers on the answer sheet, page 10.

If your score is low in this pre-test, this can be a source of satisfaction, since it may show that you were right to start perusing this Handbook and that it will be worth your while continuing!

You may also rest assured that your score in the post-test (page 613) will be another occasion for rejoicing, for it will show an appreciable gain!

If your score in the pre-test is high, you should choose areas which are still "uncertain" (those for which you did not find the correct answer) and go into the matter more thoroughly.

★

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★This pre-test deals only with theoretical knowledge related to (p. 2) objectives, group 2. You will have an opportunity of gauging how far you have achieved the group 1 objectives by doing other exercises which appear throughout the Handbook (blue pages).

## PRE-TEST ANSWER SHEET[*]

### CHAPTER I

| | | | | | |
|---|---|---|---|---|---|
| 1 | A | B | C | D | E |
| 2 | A | B | C | D | E |
| 3 | A | B | C | D | E |
| 4 | A | B | C | D | E |
| 5 | A | B | C | D | E |
| 6 | A | B | C | D | E |
| 7 | A | B | C | D | E |
| 8 | A | B | C | D | E |
| 9 | A | B | C | D | E |
| 10 | A | B | C | D | E |
| 11 | A | B | C | D | E |
| 12 | A | B | C | D | E |
| 13 | A | B | C | D | E |
| 14 | A | B | C | D | E |
| 15 | A | B | C | D | E |
| 16 | A | B | C | D | E |
| 17 | A | B | C | D | E |
| 18 | A | B | C | D | E |
| 19 | A | B | C | D | E |
| 20 | A | B | C | D | E |

### CHAPTER II

| | | | | | |
|---|---|---|---|---|---|
| 1 | A | B | C | D | E |
| 2 | T | | | F | |
| 3 | T | | | F | |
| 4 | T | | | F | |
| 5 | T | | | F | |
| 6 | T | | | F | |
| 7 | T | | | F | |
| 8 | A | B | C | D | E |
| 9 | A | B | C | D | E |
| 10 | A | B | C | D | E |
| 11 | A | B | C | D | |
| 12 | A | B | C | D | |
| 13 | A | B | C | D | E |
| 14 | A | B | C | | |
| 15 | A | B | C | | |
| 16 | A | B | C | | |
| 17 | A | B | C | | |
| 18 | T | | | F | |
| 19 | T | | | F | |
| 20 | T | | | F | |

### CHAPTER III

| | | | | | |
|---|---|---|---|---|---|
| 1 | A | B | C | D | E |
| 2 | A | B | C | D | E |
| 3 | ------------------<br>------------------<br>------------------<br>------------------ | | | | |
| 4 | A | B | C | D | E |
| 5 | ------------------<br>------------------<br>------------------<br>------------------<br>------------------<br>------------------ | | | | |
| 6 | A | B | C | D | |
| 7 | A | B | C | D | |
| 8 | A | B | C | D | |
| 9 | A | B | C | D | |
| 10 | A | B | C | D | |
| 11 | A | B | C | D | E |
| 12 | A | B | C | D | E |
| 13 | A | B | C | D | E |
| 14 | A | B | C | D | E |
| 15 | A | B | C | D | E |
| 16 | A | B | C | D | E |
| 17 | S | | | SF | |
| 18 | S | | | SF | |
| 19 | S | | | SF | |
| 20 | S | | | SF | |
| 21 | S | | | SF | |
| 22 | S | | | SF | |
| 23 | S | | | SF | |
| 24 | S | | | SF | |
| 25 | A | B | C | D | E |

### CHAPTER IV

| | | | | | |
|---|---|---|---|---|---|
| 1 | A | B | C | D | E |
| 2 | A | B | C | D | E |
| 3 | A | B | C | D | E |
| 4 | A | B | C | D | E |
| 5 | A | B | C | D | E |
| 6 | A | B | C | D | E |
| 7 | A | B | C | D | |
| 8 | A | B | C | D | |
| 9 | A | B | C | D | E |
| 10 | A | B | C | D | |
| 11 | A | B | C | D | |
| 12 | A | B | C | D | |
| 13 | A | B | C | D | |
| 14 | A | B | C | D | |
| 15 | A | B | C | D | |
| 16 | A | B | C | D | E |
| 17 | A | B | C | D | |
| 18 | A | B | C | D | E |
| 19 | T | | | F | |
| 20 | T | | | F | |

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[*] See page 9.

# 1

# EDUCATIONAL OBJECTIVES

18

This initial chapter deals with the need for a clear definition of education objectives. It emphasizes the fact that, as has been shown during experimental research in education, the most effective way of defining an educational objective is to describe the observable activity enabling the teacher and the learner to know if, how and when the objective has been attained. It describes a classification of intellectual processes which can be of great help in arranging educational objectives. Those interested in this approach should read the following works by R. F. MAGER:

1. Preparing instructional objectives (1962)
2. Goal analysis (1972)
3. Measuring instructional intent (1973) (Chapter III, pages 15 to 46)
   Fearon Publishers, California, U.S.A.
4. Criteria for the evaluation of objectives in the educational of health personnel
   WHO, Technical Report Series, 1977, No. 608

* * *

After having studied this chapter and the reference documents mentioned you should be able to:

1. define the following terms: educational objective; prerequisite level; institutional objective; specific objective; cognitive, affective, and psychomotor domain;
2. list the qualities and sources of an educational objective;
3. define the main tasks of the members of the health team;
4. identify errors in a list of educational objectives drawn up by a colleague;
5. define educational objectives at the institutional level for the establishment in which you are teaching;
6. classify educational objectives according to whether they belong primarily to the affective, psychomotor, or cognitive domain;
7. define specific objectives corresponding to a subject with which you are familiar.

If you are

NOT CERTAIN

of WHERE you are

GOING□□□□□□□□□□□□□□

you may very

well end up.....

**SOMEWHERE ELSE**

(and not even know it)

mager

## Personal notes

★

## Definition of educational objectives - an essential step before choosing teaching methods and a system of evaluation

It seems reasonable to believe that an educational programme has more chance of being effective if its purposes have been clearly expressed. Experimental research in the field of evaluation indicates that it is not possible to measure the results obtained from an educational system if its objectives have not been explicitly defined.

Let us stress again that an educational programme must be shaped selectively in terms of the aims to be achieved. Each time the goal is modified, the programme too must be modified accordingly.

Educational objectives must be generated on the basis of data obtained from different and multiple sources: health needs and resources of society, the scientific method and the progress of science, the students, the sociocultural system, etc.

Educational objectives must proceed from a prospective study of requirements and possibilities.[1]

The definition of these objectives is a subject which the universities, in regard to the teaching of health sciences, have always avoided tackling, not because they considered it unimportant but because, apparently, they thought it went without saying.

The institutional objectives of a faculty of medicine, for example, are, they say, axiomatic: "We train doctors of international quality. It is not necessary to develop the description any further; medicine is universal." However, when we try to get the teachers to define a little more fully what they are talking about we see how wide and fundamental the divergencies are as soon as we leave the sphere of generalities. The conflicts between fundamentalists and clinicians, between advocates of preventive and of curative medicine, are the result of those divergencies. This conflict becomes acute during the periodic curriculum reforms.

The method traditionally used is to bring together eminent professors and the result of their deliberations is presented as a list of chapter headings. Often existing programmes are used as the main source of data for the preparation of the new programme. The professors indicate the number of hours to be devoted to the various subjects to be dealt with: this generally leads to a conflict of personalities and it is the most forceful, the most persuasive, sometimes the most irascible or noisiest of the participants in the discussions who obtains the largest number of hours.

The result is that the time variable becomes a constant and that competence becomes a variable.[2]

Specialists in education, as a result *inter alia* of the studies which have stimulated progress in cybernetics, have recognized the need to establish models and in that same spirit a "new" technique is proposed.

---

[1] The epidemiological, sociological data, etc., and the operational research necessary for such a prospective analysis are not dealt with in this HANDBOOK. For information in these fields, the reader should consult specialized publications dealing with the organization of health services (see references p. 615 *et seq*.).

[2] For example, the length of medical studies is fixed by administrative regulations at 6 years (or 7, 5 etc.): this is the time constant. On the other hand, there is hardly any definition of the competence of graduates, and this can lead to great variability.

Educational goals must be defined by using behavioural terms corresponding to the tasks to be accomplished. In other words, the definition must indicate what the graduates of a given school will be able to DO at the end of their period of education or training that they were not able to do before.

These educational objectives are also called LEARNING objectives to distinguish them from teaching objectives. They define what the student should be able to do, not the teacher. They have been recently called COMPETENCY objectives referring to the functions required for the performance of a profession.

A teacher's expectation of high student learning motivation will not become a reality until students feel a freedom to learn, that is to say when they become involved in the decisions concerning their own educational objectives. Moreover, these objectives have to be explicitly defined and offered for their choice: even better, the students will have helped in establishing them.

Educational objectives might be divided in different ways:

If they describe the broad overall aspects of a medical school or any other centre of health sciences, they are called INSTITUTIONAL objectives.[1]

If, on the contrary, they are specific, at the level of a short learning period for example, they are called INSTRUCTIONAL (or SPECIFIC) objectives.

In between are INTERMEDIATE objectives, still broad, developed from institutional objectives at the level, for example, of departments or divisions.

Some educational objectives are called ENABLING objectives: it describes a prerequisite level in relation to another objective.

They can also be divided according to the domain of the intellectual process to which they belong:

★ affective domain = attitudes

★ psychomotor domain = skills

★ cognitive domain = knowledge

These classifications have no other aim than to facilitate an analysis of the learning process and help teachers to make educational choices.

It is true that human behaviour can rarely be neatly divided in terms of cognition and affect. This division is somewhat artificial in that neither teachers nor those responsible for programmes want to separate entirely these entities.

These differences will remain artificial so long as we do not possess the necessary instruments to study both cognitive and affective outcomes simultaneously. It is to be hoped that an increased emphasis on the definition of educational objectives will enable education researchers to resolve some of these problems and consequently assist in the choice of suitable teaching methods.

When educational objectives are described in a practical and detailed manner it is then possible to determine with some precision those learning activities suitable for attaining an objective and those which are almost or completely unsuitable.

The lack of an explicit definition of educational objectives makes discussions on programmes, teaching methods and evaluation methods completely invalid and futile.

---

[1] There may be several for one institution: as many as the number of professional categories this institution is concerned with.

The methods of evaluation (of students, teachers, and methods) will in fact depend on the objectives to be achieved. Evaluation consists in being able to say to what MEASURABLE EXTENT and HOW the objective laid down has been achieved. If care has not been taken to establish a MEASURABLE objective it will be difficult to make any kind of evaluation. To select a type of examination without educational objectives makes no more sense than trying to choose a measuring instrument without knowing what has to be measured. It is only during the last decades that investigators in the field of testing and measurement (docimology) began to work out a solution to the problem posed. Here, too, the strength of tradition and emotional reactions are making themselves felt.

The following definitions, as well as the examples and exercises, are proposed as a basis for reflection and as an opportunity for practice in making a systematic approach to the solution of your educational problems.

★

If the jargon seems obscure you should consult the glossary (page 601 et seq.)

✱

Education is a PROCESS, the chief goal of which is to bring about change in human behaviour

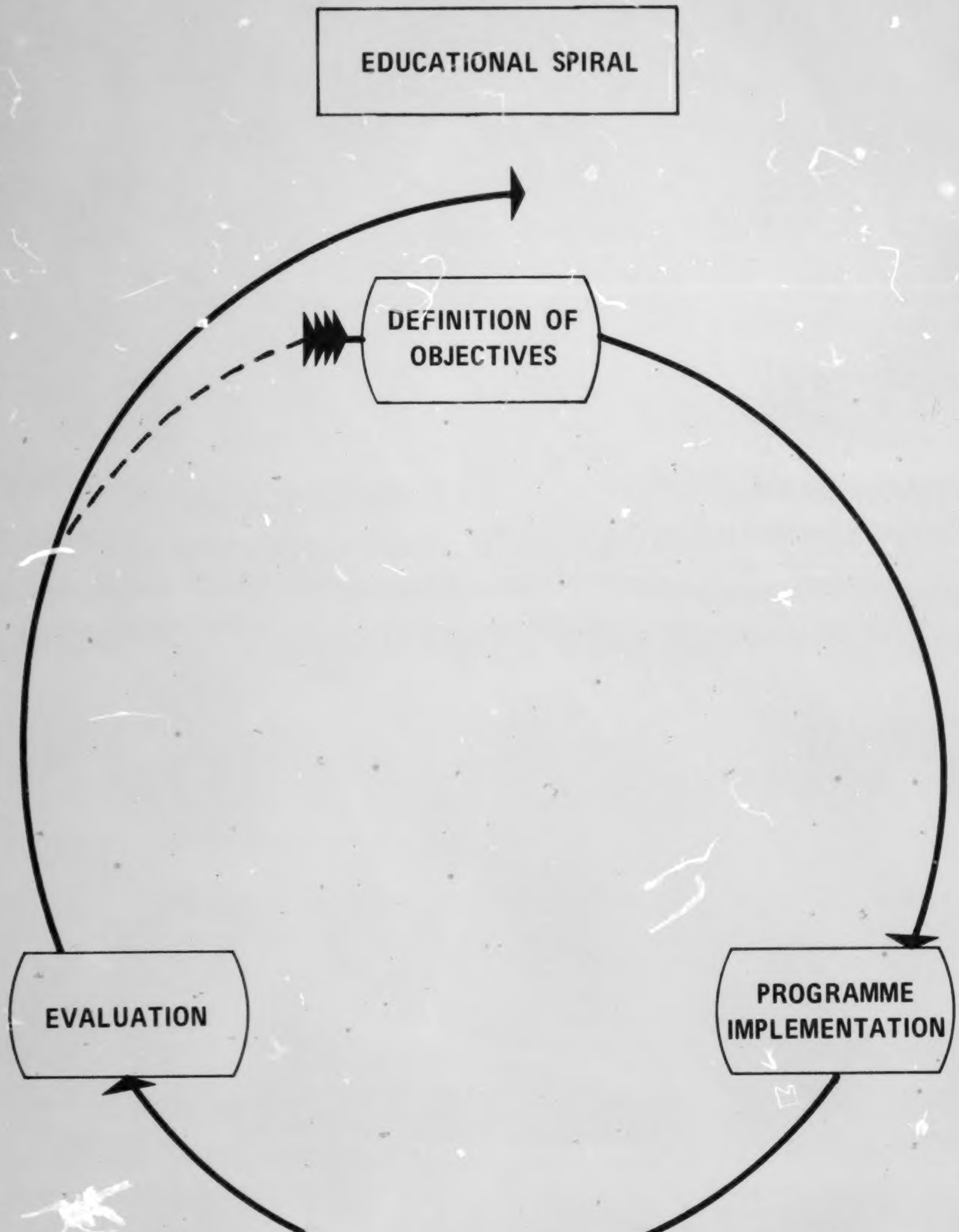
## THE RESULT OF EDUCATIONS IS:

AN EXPECTED CHANGE IN THE BEHAVIOUR OF THE STUDENT IN THE COURSE OF A GIVEN PERIOD

* * *

- This behaviour will be explicitly defined in the form of educational OBJECTIVES : they describe the expected performance.
- A PROGRAMME of teaching/learning activities will be prepared and implemented to facilitate the attainment of these objectives.
- A criterion reference EVALUATION system will make it possible to measure the extent to which the objectives have been attained – it will measure final behaviour – and will also enable better educational decisions to be taken .

* * *


EDUCATIONAL SPIRAL
DEFINITION OF OBJECTIVES
PROGRAMME IMPLEMENTATION
EVALUATION

## Personal notes

## Selection of goals[1]

There are essentially two ways of making this selection: one consists in relying on the judgement of experts to determine what a neophyte in the profession ought to know and ought to be able to do. In the past we have relied almost exclusively on this method for determining the goals of medical education. As a result curricula are crammed with an ever burgeoning quantity of new and highly specialized knowledge which the student perceives as irrelevant to his own goals and which, in fact, may be of little value to other than the super sub-specialist. Certainly expert opinion is an important source of information about the knowledge and skills which trainees should be able to demonstrate, but it is also possible to make this decision on the basis of scientific evidence about what competent physicians need to know and need to be able to do in order to deliver responsible patient care. A number of procedures have now been developed for collecting such data to provide an empirical basis for developing a behavioural description of the essential components of professional competence to guide a faculty in setting their goals and designing their curricula. Three of these are of special interest: the critical incident technique, the method of task analysis and the analysis of epidemiological data.

### The critical incident technique

This method consists in collecting comprehensive data about specific behaviours that characterize professional effectiveness and ineffectiveness and using these data to make an objective, empirical determination of the essential performance requirements of the profession. This technique is an outgrowth of studies in aviation psychology made in the United States during World War II. In that programme it was found that in reporting the reasons for eliminating a trainee, pilot instructors and check pilots frequently offered such clichés and stereotypes as "lack of inherent flying ability", "poor judgement" or "unsuitable temperament." In an effort to determine the specific qualifications of personnel that contributed to success or failure, combat veterans were asked to report incidents observed by them that involved behaviour which was especially helpful or especially inadequate in accomplishing the assigned mission. This request concluded with the statement: "Describe the officer's action. What did he do?" The several thousand incidents submitted in response to this inquiry were analyzed and categorized to provide a relatively objective and concrete description of the "critical requirements" of combat leadership.

In applying this method to the medical profession, several thousand incidents describing observations of especially effective or especially ineffective colleague behaviour are collected from several hundred physicians representing various age groups, geographic areas, types of affiliations and specialty interests. For example, in a critical incident study of intern and resident performance (i.e. of the general undifferentiated physician) commissioned by the U.S. National Board of Medical Examiners, the American Institute of Research who conducted the study collected over 3000 incidents from physicians across the country. The incidents submitted involved all areas of behaviour: cognitive, affective and psychomotor. They identified, for example, such general requisites of competence as "Skill in gathering clinical information," i.e., in taking a competent history and in performing an adequate physical examination, or "Skill in relating to the patient and in gaining his cooperation in a plan of management." In an analogous study conducted by the University of Illinois Center for Educational Development of the critical performance requirements in orthopaedic surgery, over 1700 incidents were collected from over 1000 orthopaedic surgeons representing various practice settings and sub-specialty interests. An empirical classification defining 94 critical performance requirements, grouped into 9 major categories of competence, was derived from the incidents. This operational definition of the essential components of competence could then be employed to determine the goals of specialty training, the design of programmes for their achievement and the criteria and methodology for their evaluation. If educational planning were regularly directed by such operationally defined, empirically derived goals, educational programmes would look substantially different.

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[1] From "An overview of applied research in medical education problems, principles and priorities". Christine H. McGuire. WHO Report on the Workshop on the Needs for Research in Medical Education. Alexandria, March 1974.

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## Task analysis

A second method of determining the essential components of professional competence which should define the goals of medical education consists in detailed task analysis of what physicians in various practice settings actually do and in deriving from that statement of tasks a statement of the requisite knowledge and skills which they must have in order to perform these tasks competently. Such a task analysis may be based on careful, systematic observations of a representative sample of physicians in different practice settings, or it may be based on diary studies from the daily logs of a representative sample of physicians who report in minute detail the way in which they spend their professional days over a specified period of time, or on some combination of these two approaches.

Wherever this method has been employed, the results have been most enlightening. For example, in a limited pilot study of paediatricians in a typical small U.S. city, researchers found that all the physicians had different but consistent patterns for taking a history and performing a physical examination. Of the 481 patient visits observed, 222 were well children; an average of 10.2 minutes were spent with these children (range: 7.5 minutes to 13.6 minutes) in contrast with an average of 8.1 minutes spent with ill children (range: 7.4 minutes to 10 minutes). Of the 259 ill children, 104 (i.e. 40%) were diagnosed as having an infection of the upper respiratory tract, 15 had chronic illnesses and 5 had potentially life threatening diseases. For the total group of 481, optic fundi were examined only 9 times and rectals were performed in only 6 cases; 2 physicians did not percuss the lung fields for any patient. The greatest amount of time was spent in discussion of nutrition and child development. The single most frequent topic on which advice was rendered in well-child care concerned toilet training. The authors of this study concluded, "Few aspects of well-child care appear to require the skill of a physician . . . the question is also raised as to whether current training programmes are aggravating the physician manpower shortage by overtraining in relation to community health needs."[1]

This is a question that could be reiterated in every specialty in every country; only task analysis or comparable empirical sources will give us the answer.

## Epidemiological studies

One of the most interesting of the newer approaches to the use of such sources in determining the goals of medical education consists in combining three arbitrarily weighted factors - disease incidence, individual disability and social disruption to define priorities in health care needs and, hence, in educational effort. As initially developed by Dr John W. Williamson[2] the three factors are computed as follows: disease incidence consists of a simple tabulation of the frequency of the disease (e.g. pneumonia) or other medical condition (e.g. pregnancy) in the target population. Individual disability involves a determination of the extent of a patient impairment or risk associated with a given medical condition; an Individual Disability Weight (IDW) is calculated for each condition from three elements: the average length of hospital stay, mortality rates and complication rates. Social disruption represents an estimate of the impairment that would be produced by a given disease or condition in the larger social group of which the patient is a member; it is based on such factors as cost of illness, age of patient and number of dependents, socioeconomic standing and the like. For each discharged patient a Total Priority Weight (TPW) is calculated combining these elements. This Total Priority Weight is then arbitrarily apportioned among patient diagnoses. Finally, a cumulative total for each diagnosis is calculated from the total patient sample. The resultant ranking represents a quantitative estimate of priority or health care needs for the population at risk.

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[1] Bergman, A., Probstfield, J. and Wedgewood, R. Performance analysis in pediatric practice: preliminary report. Journal of Medical Education, Vol. 42: 262 (1967).

[2] Williamson, J. et al. Journal of American Medical Association, Vol. 201: 938 (1967) and Vol. 204: 303 (1968).

It is clear that even with unlimited resources not all of these needs can be met in the present state of our knowledge. The next step therefore consists in defining the area of total health care needs which can be met, given our present understanding of disease and our present resources for therapeutic interventions. This area therefore defines the target area for application of professional understandings and skills and helps to define educational priorities. The goals of medical education for the basic undifferentiated physician can therefore be defined as encompassing those areas of health care needs which cause the greatest total *preventable* disability - i.e., those which cause the greatest total disruption that could be reduced or minimized by early diagnosis and appropriate intervention.

In his early studies using this methodology to review hospital practice in two large community hospitals in widely separated metropolitan areas in the United States, Dr Williamson found that pregnancy, involving uncomplicated delivery, ranked first or second in priority in both hospitals, that cerebral vascular accidents ranked among the first five diagnostic categories in both hospitals and that fractures of the lower extremity ranked among the first five in one hospital. These particular conditions are mentioned because in some educational institutions there is a general tendency to reduce the amount of clinical instruction for the general medical student in some of these areas. For example, instruction in orthopaedic surgery is often an elective despite the fact that trauma in general accounts for a very significant proportion of the total preventable disability.

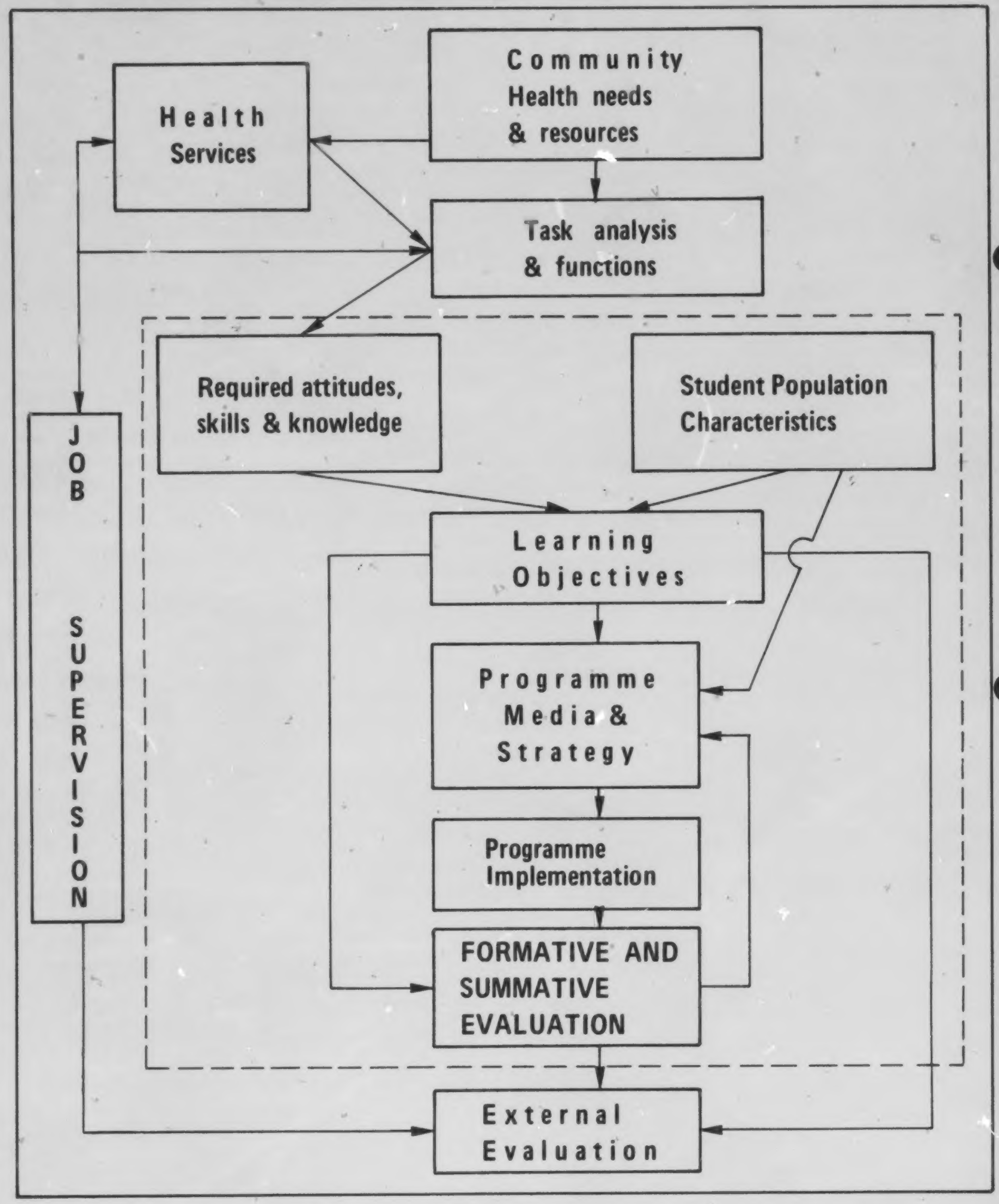
While the study reported above was limited to hospital practice, the same methodology could readily be applied to any level of health practice. Secondly, while the findings from such epidemiological studies and the particular weights to be assigned such factors as individual disability and social disruption will, of course, vary markedly in different parts of the world, the approach is clearly applicable to any population for whom health manpower are being trained. But, in all parts of the world, utilization of such data will modify the goals and priorities of educational institutions and the emphases in medical curricula, by focusing far greater attention on ambulatory medicine and on more common causes of disability than are frequently seen in teaching hospitals.

## Implications of applied research on goals and priorities

In the foregoing brief descriptions of methodology, it is suggested that the means are now at hand for supplementing expert judgement with data derived from empirical studies to assist us in defining the roles and, hence, the requisite competencies of the graduates of our programmes. Should such studies be generally undertaken and should their findings be optimally employed in developing explicit goals and objectives of education in the health professions, we would see revolutionary changes in the kinds of health professionals produced, and in their education programmes. Furthermore, such changes would have far greater impact in meeting the health care needs of the populations than the simple expansion of educational facilities of the conventional type.

☞ Those interested more deeply in this subject could refer to Health Project Management, WHO Offset Publication No. 12, Geneva, 1974.

## ORGANIZATIONAL DIAGRAM SHOWING THE RELATIONSHIPS BETWEEN THE SUBSYSTEM "EDUCATION"
(inside the broken–line quadrilateral)
## AND THE SUBSYSTEM "HEALTH SERVICE"


Health Services
Community Health needs & resources
Task analysis & functions
Required attitudes, skills & knowledge
Student Population Characteristics
JOB SUPERVISION
Learning Objectives
Programme Media & Strategy
Programme Implementation
FORMATIVE AND SUMMATIVE EVALUATION
External Evaluation

## PREREQUISITE LEVEL

**WHAT THE LEARNER HAS TO BE ABLE TO "DO"* BEFORE UNDERTAKING AN EDUCATIONAL PROGRAMME.**

---

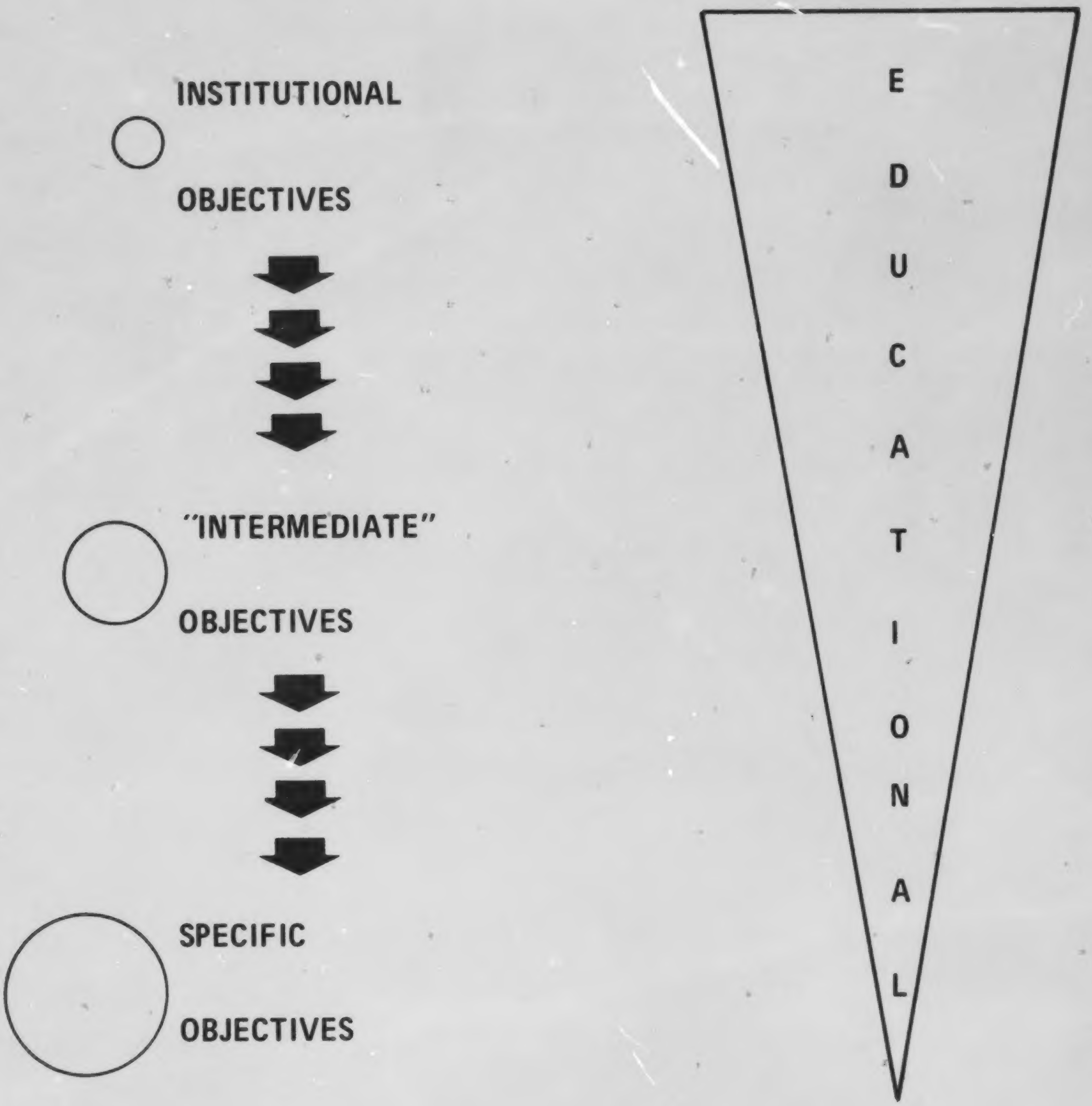
* "TO DO", i.e. a group of behaviours from which it may be concluded that the learner has the requisite knowledge, skills and attitudes.

# EDUCATIONAL OBJECTIVE

**WHAT THE STUDENTS SHOULD BE ABLE TO DO AT THE END OF A LEARNING PERIOD THAT THEY COULD NOT DO BEFOREHAND**

**The definition of the objective of a course is that of the result sought, not a description or summary of the programme.**

# TYPES OF EDUCATIONAL OBJECTIVES



INSTITUTIONAL OBJECTIVES

"INTERMEDIATE" OBJECTIVES

SPECIFIC OBJECTIVES

Note: The size of the circles (left) is directly related to the amount (number) of objectives: the more they are specific the more numerous they are: the triangle (right) indicates that at INSTITUTIONAL level objectives are "wide", vague and that specific objectives are "punctual", narrow, precise.

# TYPES OF EDUCATIONAL OBJECTIVES

1 Institutional: at the level of the educational establishment (broad, all-inclusive).

Example:

Providing preventive and curative care to the individual and the community, in health and in sickness

*

2 "Intermediate": still broad, developed from the institutional objectives.

Example:

Planning and carrying out a blood sampling session for a group of adults in the community.

*

3 Specific (or instructional): corresponding to a given learning activity: precise and measurable.

Example:

Using the syringe,to take a blood sample (5ml) from the cubital vein of an adult (criteria: absence of haematoma: amount of blood taken within 10 % of the amount required: not more than two attempts).

IN ALL CASES THEY DESCRIBE

THE BEHAVIOUR OF THE STUDENT

NOT THE TEACHER'S

★

# DATA NECESSARY TO GENERATE EDUCATIONAL OBJECTIVES

- → Health needs, demands and resources of society.
- → Services to the patient.
- → Service to the community.
- → The profession itself.
- → The students.
- → Progress in sciences.
- → The scientific method.

etc.

★

**EXERCISE**

(read page 123)

THE 5 MAIN TASKS OF..............................

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## INSTITUTIONAL OBJECTIVES

The next seven pages give examples of INSTITUTIONAL educational objectives, of different sources.

They are only examples. If they apply to the establishment where you are teaching it is by mere coincidence... or because the health needs of the populations for whom you are training health manpower have much in common with those of the populations with whom the authors of the objectives given as examples are concerned.

At the present stage this is unimportant; what should be noted is that all the examples are relatively short (one page) and relatively vague (they are also called general objectives) but that they all define what the STUDENTS should be able to do at the end of their training. They do not define what the TEACHERS do but rather what the institution's "end product" is.

**EXERCISE ★** BEFORE reading these institutional objectives take the time to list on page 121 the five major tasks of the physician (or nurse, or sanitary engineer or village health assistant, according to the type of training in which you are interested). If there is a national health plan, use it as a reference. If not, draw on your experience of your profession.

After this exercise, read the examples of institutional objectives which follow. They may seem vague and indefinite to you; indeed almost meaningless. Do not forget, however, that they cannot be considered separately but form a WHOLE together with objectives at other levels (intermediate and in particular, specific). It is this constant linkage which gives them a meaning. Moreover, even allowing for their indefiniteness you will realize their usefulness, on merely comparing them with what was taught (and still is taught) in many teaching institutions. Indeed, how many of these objectives are seriously taken into account in the curricula of your school?

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WELL CONSTRUCTED INSTITUTIONAL OBJECTIVES ARE THE FOUNDATION

OF A RELEVANT PROGRAMME

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## INSTITUTIONAL OBJECTIVES

At the end of his M.D. Programme,[1] the graduate will have acquired or developed the knowledge, abilities and attitudes necessary to qualify for further education in any medical career. He will also be able to:

1. Identify and define health problems, and search for information to resolve or manage these problems.

2. Given a health problem, to examine the underlying physical or behavioral mechanisms. A spectrum of phenomena might be included, from molecular events, to those involving the patient's family and community.

3. Recognize, maintain, and develop personal characteristics and attitudes required for professional life. These include:

   (a) awareness of personal assets, potential, limitations and emotional reactions.

   (b) responsibility and dependability.

   (c) ability to relate to and show concern for other individuals.

4. Develop the clinical skills and methods required to define and manage the health problems of patients, including their physical, emotional, and social aspects.

5. Be a self-directed learner, recognizing personal educational needs, selecting appropriate learning resources, and evaluating progress.

6. Critically assess professional activity related to patient care, health care delivery, and medical research.

7. Function as a productive member of a small group, which is engaged in learning, research or health care.

8. Work in a variety of health care settings.

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[1] From McMaster University, Canada, June 1972.

## INSTITUTIONAL OBJECTIVES[1]

Upon completion of the formal course of studies, a graduate of the M.D. programme will have acquired or developed knowledge, abilities and attitudes so that he will be able to:

A. Perform professional services within a community health care system compatible with the overall policies of the Center for Health Sciences:

   1. Identify and define present and future community health problems and work to resolve such problems by the planning, implementation and evaluation of preventive or remedial programmes.

   2. Use clinical skills, knowledge, original observations and appropriate records to identify, diagnose, manage (prevent, refer or treat rationally) and follow-up the health problems of his patients, taking into account the physical, psychological and sociocultural aspects.

   3. Work as a leading partner in a health care team.

   4. Educate the population and motivate them to improve their health.

B. Continually increase his level of competence:

   1. Take part in postgraduate training (residency programmes, specialization, courses, etc.) and teaching (students and colleagues).

   2. Periodically evaluate his professional activities, recognize his educational needs, select appropriate learning resources and evaluate his progress.

C. Aid the development of the health sciences by engaging in teaching and research and seek solutions to new health problems of his patients, community or health care system with which he is not familiar.

D. Maintain and develop personal characteristics and attitudes required for professional life, such as personal integrity, sense of responsibility and dependability, and ability to relate to, communicate with and show concern and respect to his patients and colleagues.

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[1] Ben Gurion University of the Negev, University Center for Health Sciences, Beer-sheba, Israel.

## INSTITUTIONAL OBJECTIVES[1]

At the end of their Doctor in Pharmacy programme the graduates should be able to:

1. Monitor drug therapy, including the prevention, detection, and correction of drug-related problems.

2. Manage and optimize drug therapy relative to the total needs of the patient, in collaboration with the physician, nurse, and other health professionals.

3. Provide supportive clinical services such as drug information, drug surveillance, and drug delivery and distribution.

4. Develop the administrative systems to maximise the use of physical, fiscal, and human resources to implement pharmaceutical services.

5. Assume delegated responsibilities for the drug therapy management of patients with specific diseases. This involves screening, evaluation, managing, and follow-up procedures in diseases such as hypertension, diabetes mellitus, arthritis, and certain mental illnesses.

6. Set therapeutic objectives, and monitor patients for desired therapeutic response; design, and utilize acceptable drug therapy management protocols.

7. Collect, analyse, interpret, and evaluate appropriate subjective and objective data necessary to identify the patient's therapeutic needs; obtain patient drug histories and apply these histories along with those taken by others, drug record systems, and other patient data related to drug therapy management.

8. Evaluate the effect of drug therapy on major disease processes; evaluate how the signs and symptoms may be modified by drug therapy.

9. Detect drug-induced disease processes and differentiate these from other disease processes.

10. Detect and evaluate the clinical importance of adverse drug reactions and interactions; provide effective and appropriate management solutions to these problems and contribute to their prevention.

11. Analyse the epidemiological aspects of adverse drug reactions and evaluate drug usage patterns; develop and use drug surveillance reporting systems for the detection, management, and prevention of adverse drug reactions with particular emphasis on the objective methods and systems to monitor potential and incident adverse effects.

12. Use, and critically evaluate current drug studies in the medical and pharmaceutical literature.

They should be able to perform these functions in all types of practices.

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[1] From the Doctor of Pharmacy Program Proposal submitted to the State Council of Higher Education by The School of Pharmacy, Medical College of Virginia, Virginia Commonwealth University, 19 August 1974.

## INSTITUTIONAL OBJECTIVES[1]

At the end of her School of Nursing Baccalaureate Program the graduate should be able to:

1. Provide effective nursing care to people of all ages at all levels of wellness in a variety of settings.
2. Apply the nursing process in the delivery of health care to individuals and groups.
3. Demonstrate an effective use of self in her interactions with others.
4. Collaborate with individuals and groups in reaching realistic health goals.
5. Initiate change to improve the quality of professional nursing practice and the delivery of health care.
6. Seek opportunities for continual growth as a person, a citizen, and a professional.
7. Practise nursing within a framework which is congruent with her own philosophy of nursing.

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[1] From Boston University Bulletin 1974/75.

## INSTITUTIONAL OBJECTIVES[1]

At the end of her Undergraduate school of nursing programme, the nurse should be able to:

1. Assess with individuals and groups, their health-illness status and context in order to determine nursing care implications.
2. Collaborate with others to synthesize plans to improve health care.
3. Formulate a plan of nursing care which contributes to the total plan of health care.
4. Implement plans for health and nursing care within broad health care plans or systems.
5. Implement teaching to improve nursing and health care.
6. Evaluate the effectiveness of nursing care and health plans and systems.
7. Develop and maintain helpful relationships with individuals that would facilitate health care.
8. Use research knowledge applicable to nursing and health care.
9. Apply research skills to solve and/or study nursing and health problems.
10. Appreciate the historical aspects of the profession of nursing and health care and their relationship to current and futuristic goals in the delivery of health care service.
11. Use appropriate independent leadership and collaborative role relationships as indicated by the goals to be accomplished.
12. Demonstrate concern for the uniqueness and rights of individuals and groups in relation to health care.
13. Develop continually self-awareness.
14. Continue developing the ability to learn and being responsible for own learning.
15. Use social actions with responsibility to bring about changes in the interest of promoting health.
16. Use dynamic technological advances to improve nursing and health care.

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[1] Adapted from the University of Washington Bulletin, 1973/75.

## INSTITUTIONAL OBJECTIVES[1]

### Description of Practitioner of Tomorrow

The graduate of the new baccalaureate nursing programme will be prepared to function as a generalist with beginning competencies in a specialized area of nursing.

The graduate will be prepared to function in a variety of settings and be able to:

1. Obtain health histories and make general health assessments.
2. Provide safe and competent care in emergency situations and acute illnesses.
3. Provide supportive care to persons with chronic or terminal health problems.
4. Provide health teaching, guidance and counselling.
5. Assist persons to maintain optimal health status.
6. Provide for continuity of health services.
7. Assume leadership responsibility for planning and evaluating nursing care.
8. Work effectively with all persons concerned with health care problems.

This baccalaureate nurse, as a practitioner of nursing, will be accountable and responsible to clients for the quality of nursing whether administered directly or indirectly.

---

[1] From the University of Washington School of Nursing.

## INSTITUTIONAL OBJECTIVES

At the end of his training the Public Health Dental Assistant[1] should be able to:

1. Educational - organize and provide to individuals and groups oral health education, adapted to age, cultural, and socioeconomic factors, on oral hygiene practices, preventive oral measures, nutrition, accident prevention, consequences of ritual dental mutilations, oral health as a part of total health.

2. Diagnostic

2.1 differentiate between oral conditions which the PHDA is able to treat and those requiring referral

2.2 diagnose periodontal diseases (gingivitis, periodontitis and periodontal abscesses)

2.3 diagnose dental caries and resulting conditions (pulpitis, apical periodontitis, and acute apical abscesses)

2.4 make preliminary diagnosis of traumatic injuries to structures of the oral cavity

2.5 take, process and interpret radiographs of teeth and surrounding structures.

3. Preventive and curative

3.1 scale and polish teeth

3.2 apply topical preventive agents

3.3 administer local anaesthetics, analgesics and specified medicaments for treatment of oral diseases

3.4 perform simple extractions of teeth and treat specified complications

3.5 perform simple cavity preparations and fillings

3.6 perform intra-oral incision and drainage of dental abscesses, place and remove sutures

3.7 provide emergency dental treatment within the scope of training and initial treatment of traumatic injuries

3.8 perform cardiopulmonary resuscitation according to local instructions.

4. Administrative

4.1 chart diagnosed conditions and record a patient treatment plan indicating current and all completed dental treatment

4.2 clean and sterilize dental instruments and equipment

4.3 maintain dental supplies (instruments, expendable supplies, medicaments, surgery equipment)

4.4 perform simple repairs of dental equipment

4.5 submit periodic summaries for monitoring the prevalence and other changes in disease experience

4.6 prepare and submit through channels periodic reports on the services performed by the PHDA

4.7 complete administrative procedures for patients requiring referral dental care.

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[1] School for Public Health Dental Assistants, Kampala, Uganda.

Now . . . . . .

draw up INSTITUTIONAL educational (student oriented) objectives suitable for the establishment where you are teaching and based on the FIVE main tasks you have described (page 121).

## INTERMEDIATE OBJECTIVES

### OBJECTIVE OF THE DEPARTMENT OF EPIDEMIOLOGY AND PREVENTIVE MEDICINE[1]

At the end of his university studies the student should have the motivation for and be able to:

→ plan and undertake, in cooperation with other members of the health team epidemiological studies of an analytic or descriptive nature;

→ evaluate the results of these studies within the framework of the economic and social structure of the regional or national community and describe them in ecological terms;

→ plan and undertake, with the aid of other members of the health team, the application of preventive measures against the communicable and nutritional diseases as well as against the noncommunicable diseases (occupational or hereditary diseases), according to their epidemiological priority;

→ improve health (health promotion), i.e. improve the wellbeing of the population as a whole, even in the absence, pathologically speaking, of any specific disease.

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[1] University Health Sciences Centre (CUSS), Yaoundé, United Republic of Cameroon.

## INTERMEDIATE OBJECTIVES[1]
## (BASIC NEUROSURGERY)

A graduate should be able to:

1. Perform and record a neurological examination, and decide whether the data elicited support or confirm the presence of a disorder in the central or peripheral nervous system.
2. Suspect from patient data the presence of urgent remedial neurosurgical situations
    (a) Acute and chronic intracranial haematoma
    (b) Hydrocephalus
    (c) Mass effects producing brain or spinal cord distortions
3. Select the appropriate clinical and laboratory procedures essential to the clinical evaluation of the suspected neurosurgical disorders.
4. Describe the hazards, attributes, and limitations of the laboratory procedures commonly employed in the clinical investigation of neurosurgical disorders (EEG, echoencephalography, lumbar puncture, pneumoencephalography, ventriculography, arteriography, myelography and radiography of skull and spine, and isotope scanning).
5. Perform a lumbar puncture demonstrating proper techniques and proper recording of pressures.
6. Perform cell count, Pandy test, and evaluate bloody spinal fluid.
7. Initiate a satisfactory course of treatment for injuries of the brain, spinal cord, and its coverings.
8. Describe pathology of the common neurosurgical conditions.
9. Describe the principles of prevention, recognition, and treatment of the metabolic, cardiovascular, pulmonary, gastrointestinal, cutaneous, locomotor, and genito-urinary disorders associated with central nervous system failure.
10. Extrapolate from the symptoms of pain its informational (diagnostic) value.
11. Demonstrate a knowledge of the reasonable clinical expectation to be derived from operative neurological surgery.

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[1] University of Southern California Medical School, Los Angeles.

# INTERMEDIATE OBJECTIVES[1] (MEDICAL PHYSIOLOGY)

## Experimental methods and principles

1. Given Green's (an introduction to human physiology), Ganong's (a review of human physiology) and notes supplied during the course, define all words and concepts mentioned in the text.

2. State a principal experimental approach by means of which knowledge concerning the function of any organ could have been acquired.

3. Presented with a set of relevant data be able to:

   (a) put up an equation based upon the law of energy or mass conservation allowing a determination of the blood flow of the organ in question,

   (b) describe in words what the equation states,

   (c) decide which assumptions must be made for the equation to be valid,

   (d) solve the equation,

   (e) calculate blood flow values in both "static" and "dynamic" "systems".

4. Presented with data on physiologically relevant problems or concepts contained in the syllabus

   (a) give a systematical description of such data shown in figures, graphs, and tables.

   (b) decide, which conclusions - particularly regarding cause/effect relationships - that may be drawn solely on the basis of the data presented, i.e. without regard to the usual physiological concepts and theories.

   (c) decide which conclusions may be drawn with respect to whether the observations are consistent with the accepted theories, i.e. whether the observations may "be explained" by means of the usual textbook conceptions of the relationships between the phenomena observed. Or instead, give reasons for his/her own conceptions at variance with those of the textbooks.

Re. 4. on evaluation of data:

with access to a textbook of statistics:

4.1 compare two sets of results giving the level of significance of the difference between them and give the presumptions for the statistical comparison,

4.2 given an article, paper, or similar dealing with elements or parameters of the syllabus be able to make a summary, adhering to a presented set of standard criteria supplied by a number of scientific associations.

5. Concerning clinically relevant applications

Presented with a description of a case the student should be able to:

5.1 point out symptoms and signs signalling abnormal function of the body or of its organs,

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[1] Institute of Physiology, University of Aarhus, DK 8000 C Aarhus, Denmark.

5.2 (a) explain how to collect pertinent additional information with the purpose of deciding whether abnormal function is present and eventually clear up,

(b) explain which functional elements/partial functions are abnormal,

(c) give the principal causes of such abnormal function,

(d) indicate where the affection may be localized,

(e) distinguish between subjective and objective types of examinations/data,

5.3 presented with data from such examinations

(a) interpret the data, i.e. explain what each parameter may be an expression of and give the principal causes of the deviations present,

(b) formulate a pato-physiologic "diagnosis" (hypothesis) that explains the data presented.

5.4 by setting up a programme of examinations contained in the syllabus given, list them according to priority beginning with the simplest and ending up with the most complicated (e.g. when estimating renal function measuring urine volume and osmolarity before making any direct clearance determinations.

## 6. Clinically relevant facts (probably not contained in the syllabus)

6.1 state, that regular use is necessary with any functional element in the body to maintain optimal function and give examples of this from both afferent and efferent CNS functions,

6.2 define subjective clinical methods as methods that include the cooperation of the patient (e.g. stating of sensory impressions),

6.3 define objective clinical methods as opposite of 6.2.

## 7. Regarding experimental lab courses

Presented with material of the same type as produced or seen by the practical classes, the student should be able to:

7.1 state the principle of methods employed, e.g. the $P_{CO_2}$-electrode is based on measuring the pH of a weak bicarbonate solution the $P_{CO_2}$ of which is in equilibrium with that of the measured sample,

7.2 define specificity, sensitivity, accuracy and precision as stated below,

7.3 given information of how results have been obtained explain

(a) whether the results show signs of systematic errors,

(b) if yes, point out in which part of the procedure the error may be located (experimental or analytic error most likely).

## SPECIFIC OBJECTIVES

What are the qualities of a specific educational OBJECTIVE

An instructional objective MUST have ALL the following qualities:

RELEVANT : It should be based on the educational needs of the learner and the institutional objectives. This means stripping away all unnecessary material and making sure that useful points are covered.

LOGICAL : The objective must be internally consistent.

UNEQUIVOCAL : Its meaning must be clear to the reader, and as there are many "loaded" words (words open to a wide range of interpretation) when we use such words we leave ourselves open to misinterpretation.

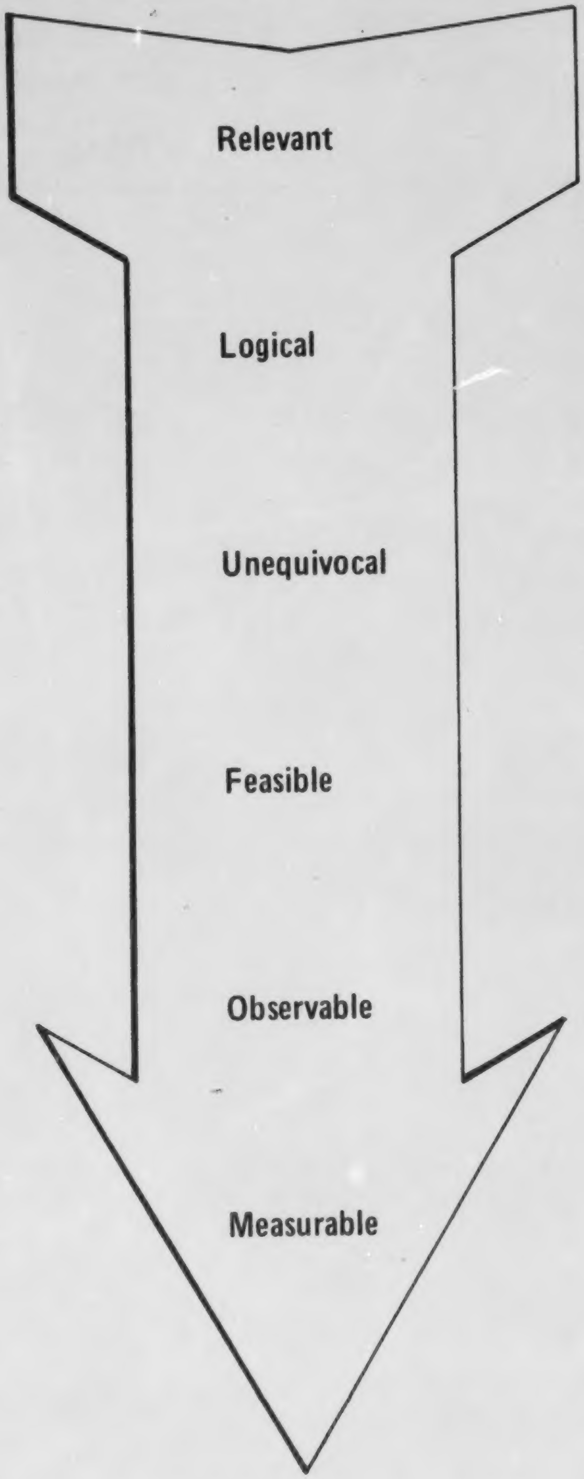
What do we mean when we say we want a learner to "know" something? Do we want him to be able to recite, or to solve, or to construct? Just to tell him we want him to "know" tells him little or can mean many things. Until you describe what the learner will be DOING when demonstrating that he "knows" or "understands" you have described very little.

FEASIBLE : It is essential to ascertain that what the student is required to do can ACTUALLY be done. It should be achievable within the time available and with the facilities at hand. Remember also the prerequisites of feasibility: the minimum level a learner should possess to qualify for the course (attitudes, skills and knowledge). This is the prerequisite level.

OBSERVABLE : It is, in fact, obvious that if the objective cannot be observed by some means it will not be possible to ascertain whether it has been achieved.

MEASURABLE : One very often hears "many of the things I teach are intangible and CANNOT BE MEASURED". Even gross measurement is better than no measurement at all, for if no measurement is made, instructors tend to assume that a goal is being achieved because they have taught. If your teaching skills cannot be evaluated, you are in the awkward position of being unable to demonstrate that you are teaching anything at all. That is why there is a need for including in the objective an indication of minimally acceptable performance.

## QUALITIES OF A SPECIFIC EDUCATIONAL OBJECTIVE



**Relevant**

**Logical**

**Unequivocal**

**Feasible**

**Observable**

**Measurable**

## WORDS OFTEN USED BUT OPEN TO MANY INTERPRETATIONS

- TO KNOW
- TO UNDERSTAND
- TO REALLY UNDERSTAND
- TO APPRECIATE
- TO FULLY APPRECIATE
- TO BELIEVE
- TO HAVE FAITH IN

ETC ...

(MAGER 1962)

## WORDS OPEN TO FEWER INTERPRETATIONS

- TO WRITE
- TO RECITE
- TO IDENTIFY
- TO DIFFERENTIATE
- TO SOLVE
- TO CONSTRUCT
- TO LIST
- TO COMPARE
- TO CONTRAST

→

## LIST OF ACTIVE VERBS FOR STATING EDUCATIONAL OBJECTIVES

- nonrestrictive list -

Abbreviate
Act
Administer
Aid
Allow for
Analyse
Apply
Appraise
Arrange
Assist
Ask
Assemble
Attend
Audit
Avoid
Bring
Build
Calculate
Care for
Categorize
Change
Chart
Check
Choose
Circle
Cite
Clean
Close
Collaborate
Collect
Communicate
Compare
Compile
Complete
Compute
Conclude
Conduct
Connect
Construct
Contrast
Contribute
Control
Convert
Cooperate
Correct
Create
Criticize
Decide
Decrease
Deduce
Defend
Define
Delimit
Demonstrate
Derive
Describe
Design
Designate
Detect
Determine
Develop
Diagnose
Diagram
Differentiate
Direct
Discover
Discriminate
Display
Dissect
Distinguish
Divide
Do
Draw
Edit
Effect
Encourage
Enumerate
Enunciate
Establish
Estimate
Evaluate
Examine
Exchange
Execute
Explain
Extract
Extrapolate
Facilitate
Fill
Find
Follow
Formulate
Furnish
Generalize
Generate
Get
Give
Guide
Hold
Identify
Illustrate
Implant
Include
Increase
Indicate
Induce
Infer
Inform
Insert
Integrate
Isolate
Justify
Label
Lead
List
Locate
Maintain
Make
Manipulate
Map
Match
Measure
Meet
Mobilize
Modify
Move
Name
Note
Narrate
Obtain
Omit
Operate
Oppose
Order
Organize
Outline
Paraphrase
Participate
Perform
Pick
Place
Plan
Play
Ploy
Point
Position
Practise
Predict
Prepare
Present
Prevent
Prognose
Promote
Protect
Provide
Pursue
Put
Raise
Read
Recite
Reassure
Rearrange
Record
Reconstruct
Recount
Reduce
Regroup
Relate
Remove
Reorder
Reorganize
Rephrase
Replace
Request
Reset
Resolve
Respond
Restate
Safeguard
Select
Send
Separate
Serve
Set
Share
Simplify
Solve
Sort
Speak
Specify
Start
State
Store
Structure
Suggest
Supply
Support
Synthesize
Tabulate
Take responsibility (for)
Teach
Tie
Time
Trace
Translate
Treat
Underline
Use
Utilize
Verify
Wash
Weigh
Work
Write

etc....

RELEVANCE

IS THE ESSENTIAL QUALITY

OF EDUCATIONAL OBJECTIVES

*

OBJECTIVES WHICH HAVE EVERY

QUALITY EXCEPT RELEVANCE

ARE POTENTIALLY DANGEROUS

TO SAY WHAT ONE MEANS BY A GOAL

IS NEITHER TO REDUCE THE IMPORTANCE

OF THE GOAL OR ITS PROFUNDITY.

*

THE ACT OF WRITING IT DOWN MEANS MERELY

THAT WHAT WAS ONCE SECRET IS NOW OPEN

FOR INSPECTION AND IMPROVEMENT

(MAGER, 1972)

# ELEMENTS OF A LEARNING OBJECTIVE

✱ - ACTIVITY

✱ - CONTENT

✱ - CONDITION

✱ - CRITERIA

★ ⇨

## DESCRIPTION OF THE ACTIVITY*

It is perfectly acceptable for the ACTIVITY (of a specific objective) to be stated as a "performance indicator" and not the actual activity provided that the latter is perfectly evident.

- The actual activity is the description of the task aimed at by a given objective:

  Example = "repair a binocular microscope"

- The performance indicator is the description of an act from observation of which the ability to perform the actual activity can be inferred:

  Example = "underline in the diagram the names of all veins that pass IN FRONT of the corresponding artery"

Here it is quite obvious that if the activity consists in "underlining" it is only a performance indicator from which can be inferred whether the student is able "to distinguish veins possing IN FRONT from veins in some other position".

In all cases, the procedure to be followed as concerns the ACTIVITY (actual or performance indicator) is as below:

1. Identify the activity (for example, by underlining it in the sentence).
2. Decide whether it is an actual activity or a performance indicator.
    - 2.1 If it is a performance indicator, decide whether it enables an inference to be made concerning the actual activity.
        - (a) If so, decide whether it can be simplified and whether it corresponds well to the student's level.
        - (b) If not, write another one.
    - 2.2 If it is an actual activity, decide whether it is explicit or implicit.
        - (a) If it is explicit, decide whether it can be simplified and whether it corresponds well to the student's level.
        - (b) If it is implicit, include a "performance indicator".

---

* For more details see MAGER, measuring instructional intent, pp. 24-38.

Let us take an example of a specific educational objective and identify each of its elements:

> "Identify, from memory, on a drawing of a horizontal section of the neck passing through the seventh cervical vertebra the name of all the vessels (arterial, venous and lymphatic) as shown in Professor X's book."

★ACTIVITY = "Identify the name of"...

★CONTENT = Cervical anatomy, level of the C7 vertebra.

★CONDITION = Definition of the main conditions under which the act should take place (data, restrictions and limitations); in this particular case the student must do the identification "from MEMORY".

★CRITERION = Definition of the MINIMUM LEVEL OF PERFORMANCE of the student. In this particular case he must identify ALL the vessels, the reference being a given author.

**Exercise.** identify each element of the following objective:

> to be able to: repair a binocular microscope (brand X, Y or Z) having been informed of the defect and given a descriptive diagram, appropriate tools and spare parts, so that the microscope functions according to specifications.

The following pages include examples of specific objectives as prepared by workshops participants or found in documents produced by medical schools.

## SPECIFIC OBJECTIVES

The student should be able to:

1. List, without referring to a textbook, at least three important symptoms of pre-eclampsia.

2. Read one issue of a professional journal every fortnight, outside working hours, and write a summary (not more than 10 lines) of at least one of the articles.

3. Give oral care with the available equipment to a patient confined to bed and conscious, according to technical sheet X.

4. Find out the health needs of a family in its environment, by paying six domiciliary visits.

    (a) Write out in chronological order all the stages of the domiciliary technique.

    (b) Apply the technique described to the previous item and prepare a plan of action.

5. Make a survey of the habits and customs of a population so as to identify those which represent a health danger.

    (a) Prepare questionnaires.

    (b) Carry out the survey.

    (c) Interpret the results.

6. During a prenatal consultation, carry out examinations for detecting and preventing complications of pregnancy (technical sheet Y).

7. Interpret the clinical signs of an extra-uterine pregnancy described in the report on a patient and make a differential diagnosis on the basis of the clinical picture accompanying the report.

8. Give two similar and two dissimilar characteristics concerning:

    (a) the immunological value of

    (b) the epidemiological indications for

        - inactivated, and
        - attenuated, polio vaccines.

9. Measure the height when lying down of a newborn baby, with a maximum error of 1%.

10. Construct, using simple, already tabulated data, a HISTOGRAM including title, coordinates, additional details and a correct, neat and readable curve.

11. Identify by microscopic examination three of the following micro-organisms: meningococcus, Hansen's bacillus, human tubercle bacillus, and gonococcus.

12. Using an optical microscope (magnification x 40) diagnose granulation tissue on a slide in five minutes, indicating at least five points of recognition present on the slide.

13. Identify in the course of a dissection all the vessels and nerves in the axilla which it is absolutely essential not to injure.

14. Make a macroscopic diagnosis of a benign breast tumour in an operation specimen and indicate at least four characteristics of benignity observed.

# TAXONOMY OF INTELLUCTUAL PROCESSES[1]

## 1. DEFINITION AND VALUE OF TAXONOMIC CLASSIFICATIONS

A taxonomy is a hierarchical classification in a given field. Taxonomies in the field of education provide a classification of various instructional objectives, at suitable levels, in given spheres. This constitutes a descriptive system based on logical principles in accordance with the existing data in education and psychology.

To help teachers formulate precisely the educational objectives, taxonomies of learning levels have been developed by various groups concerned with educational problems.

One of their reasons was to try and clear up the confusion which resulted from the use of ambiguous propositions such as "the student should have a good understanding (or knowledge) of the principles of ...".

"Good understanding of the law of X" may signify for some that the student should be capable of giving the mathematical formula for the law or saying what it means, and for others that he should also be able to use the formula to solve a problem or show the interdependence of the law in relation to other phenomena. No one questions the need for students to have a "good understanding" of a particular phenomenon, law or principle, fact or theory. However, what satisfies one teacher and enables him to say whether a student has in fact achieved a "good understanding" may be very different from what would satisfy another teacher, unless they have agreed on what they mean by "good understanding" through the use of a non-ambiguous terminology.

Education has often been criticized for the imprecision of its terminology and concepts. The chief value of a taxonomy is that it enables educators to communicate among each other more precisely.

This better understanding will make possible the collective work of those responsible for curriculum construction. A taxonomy could also be of use in evaluating the results of a system of education, through classification of educational objectives given on the basis of a standard taxonomy. Definition and evaluation of the quality of the instruction in a school, country or region poses a very difficult problem; and a well-designed taxonomy can play an important role in finding a solution. Another important function of a taxonomy is to help educators to construct examinations for students who have received instruction. A taxonomy is also useful in general as a research tool in education and evaluation.

---

[1] Summary of an article by Dr J.-J. Guilbert (AFRO internal publication, WHO, 1970, 18 pages - in French; DIDAKTA MEDICA, February 1971 - in English; Formazione Permanente del Medico, April 1974 - in Italian).

## 2. THE DIFFERENT TAXONOMIES OF EDUCATIONAL OBJECTIVES

### 2.1 Cognitive domain[1]

The first category in this classification is knowledge. Knowledge involves the recall of specifics and universals, and of methods and processes, or the remembering of a pattern, structure or setting.

Objectives that emphasize the memorization of facts, principles, processes and patterns in different subject areas belong to this category of the taxonomy.

The second category is comprehension. It includes grasping communication accurately, putting it into a different form of presentation, reorganizing material in summary form without changing the central meaning of the communication, and extrapolation.

The third category concerns the application or use of general ideas, principles or methods to new situations.

The fourth category concerns analysis. This consists essentially of the breakdown of material into its constituent parts, and detection of the relationships of the parts and of the way they are organized.

The fifth category is synthesis, i.e. the ability to put parts or elements together to form a coherent whole.

The last category is that of evaluation. It is defined as "the making of judgements about the value, for some purpose, of ideas, works, solutions, methods, material, etc. It involves the use of criteria as well as standards for appraising the extent to which particulars are accurate . . . or satisfying. The judgements may be either quantitative or qualitative, and the criteria may be either those determined by the student or those which are given to him".[2]

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[1] Bloom, B. S. (ed.), Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain, David McKay, New York, 1956.

[2] *Ibid*., Bloom, page 185.

## - COGNITIVE DOMAIN -

1. Knowledge
    - 1.1 Knowledge of specifics
    - 1.2 Knowledge of ways and means of dealing with specifics
    - 1.3 Knowledge of universals and abstractions or symbols in a field
2. Comprehension
    - 2.1 Translation
    - 2.2 Interpretation
    - 2.3 Extrapolation
3. Application
4. Analysis
    - 4.1 Analysis of elements
    - 4.2 Analysis of relationships
    - 4.3 Analysis of organizational principles
5. Synthesis
    - 5.1 Production of a unique communication
    - 5.2 Production of a plan, or proposed set of operations
    - 5.3 Derivation of a set of abstract relations
6. Evaluation
    - 6.1 Judgement in terms of internal evidence
    - 6.2 Judgement in terms of external criteria (going beyond the field of knowledge of the discipline and involving the cultural norms of science as a whole)

2.1.2 In 1963, C. McGuire[1] proposed a simpler taxonomy derived from that of Bloom and more appropriate for the preparation of achievement tests for medical students.

Level 1. Knowledge
  1.1 Recall
  1.2 Recognition of meaning
2. Generalization
3. Problem solving of a familiar type
  3.1 Interpretation of data
  3.2 Application
4. Problem solving of an unfamiliar type
  4.1 Analysis of data
  4.2 Special application
5. Evaluation
6. Synthesis

In 1967, the same author further simplified the classification, proposing four levels:

1. Recall of facts, or generalization
2. Interpretation of specific data
3. Problem solving
4. Evaluation or synthesis of a total situation

→ Three levels seem to satisfy the needs of evaluation

➧ ➧ ➧

---

[1] Centre for Education Development, University of Illinois Medical School.

## TAXONOMIC LEVEL

### COGNITIVE DOMAIN

1. RECALL OF FACTS

⬇

2. INTERPRETATION OF DATA

⬇

3. PROBLEM SOLVING

## 2.2 Affective domain[1]

This taxonomy comprises five main categories.

The first category, that of "receiving" or attending, includes sensitivity to the existence of a certain phenomenon or stimulus, and awareness, which is almost a cognitive behaviour. It also includes willingness to receive or attention.

The second category is responding. At this level the learner is sufficiently involved in a "subject, phenomenon or activity that he will seek it out and gain satisfaction from working with it or engaging in it".[2]

The third category is valuing. At this level the behaviour is consistent and stable, and it involves not only the acceptance of a value but also preference for it and a commitment to or conviction for a certain point of view or ideal.

The fourth category, organization, concerns the level at which the learner constructs a value system which guides his behaviour.

The fifth category is characterization by a value or value complex. "At this level of internalization the values already have a place in the individual's value hierarchy, are organized into some kind of internally consistent system, have controlled the behaviour of the individual for a sufficient time that he has adapted to behaving this way; and an evocation of the (value system and related) behaviour no longer arouses emotion or affect, except when the individual is threatened or challenged".[3]

A simplified, three-level classification is proposed, restricted to:

1. receiving
2. responding
3. internalization.

---

[1] Krathwohl, D. R., Bloom, B. S., Masia, B. B., Taxonomy of Educational Objectives, Handbook II: Affective Domain, David MacKay Company, Inc., New York, 1964.

[2] Ibid., p. 178.

[3] Ibid., p. 184.

## AFFECTIVE DOMAIN

1. Receiving (Attending)
   - 1.1 Awareness
   - 1.2 Willingness to receive
   - 1.3 Controlled or selected attention

2. Responding
   - 2.1 Acquiescence in responding
   - 2.2 Willingness to respond
   - 2.3 Satisfaction in response

3. Valuing
   - 3.1 Acceptance of a value
   - 3.2 Preference for a value
   - 3.3 Commitment (conviction)

4. Organization
   - 4.1 Conceptualization of a value
   - 4.2 Organization of a value system

5. Characterization by a value or value complex
   - 5.1 Generalized set
   - 5.2 Characterization

## TAXONOMIC LEVEL

### AFFECTIVE DOMAIN

1. RECEIVING

↓

2. RESPONDING

↓

3. INTERNALIZATION

## 2.3 Psychomotor domain[1]

The proposed classification of psychomotor behaviour comprises five categories.

The first category is imitation. When the learner is exposed to an observable action, he begins to make a covert imitation of the action at the level of his muscular system, guided by an impulse to imitate it.

The second category is that of manipulation. At this stage, the learner is able to perform an act according to instruction and not merely on the basis of observation. He also begins to differentiate between one set of acts and another, becomes capable of selecting the act required, and begins to attain skill in manipulating selected implements.

In the third category, called precision, the proficiency of performance reaches a higher level of refinement in reproducing a given act.

The fourth category concerns articulation. It involves, essentially, the coordination of a series of acts by the establishment of an appropriate sequence (internal consistency) among different acts.

The fifth category concerns naturalization of a single act or a series of articulated acts. The skill of performance attains its highest of proficiency, and the act is performed with minimum expenditure of energy.

A simplified, three-level classification is suggested, limited to:

1. imitation
2. control
3. automatism.

---

[1] R. H. Dave, International Conference of Educational Testing, Berlin, 16-24.5.67.

## PSYCHOMOTOR DOMAIN

1. Imitation
   - 1.1 Impulsion
   - 1.2 Overt repetition
2. Manipulation
   - 2.1 Following direction
   - 2.2 Selection
   - 2.3 Fixation
3. Precision
   - 3.1 Reproduction
   - 3.2 Control
4. Articulation
   - 4.1 Sequence
   - 4.2 Harmony
5. Naturalization
   - 5.1 Automatism
   - 5.2 Interiorization

## TAXONOMIC LEVEL

### PSYCHOMOTOR DOMAIN

1. IMITATION

↓

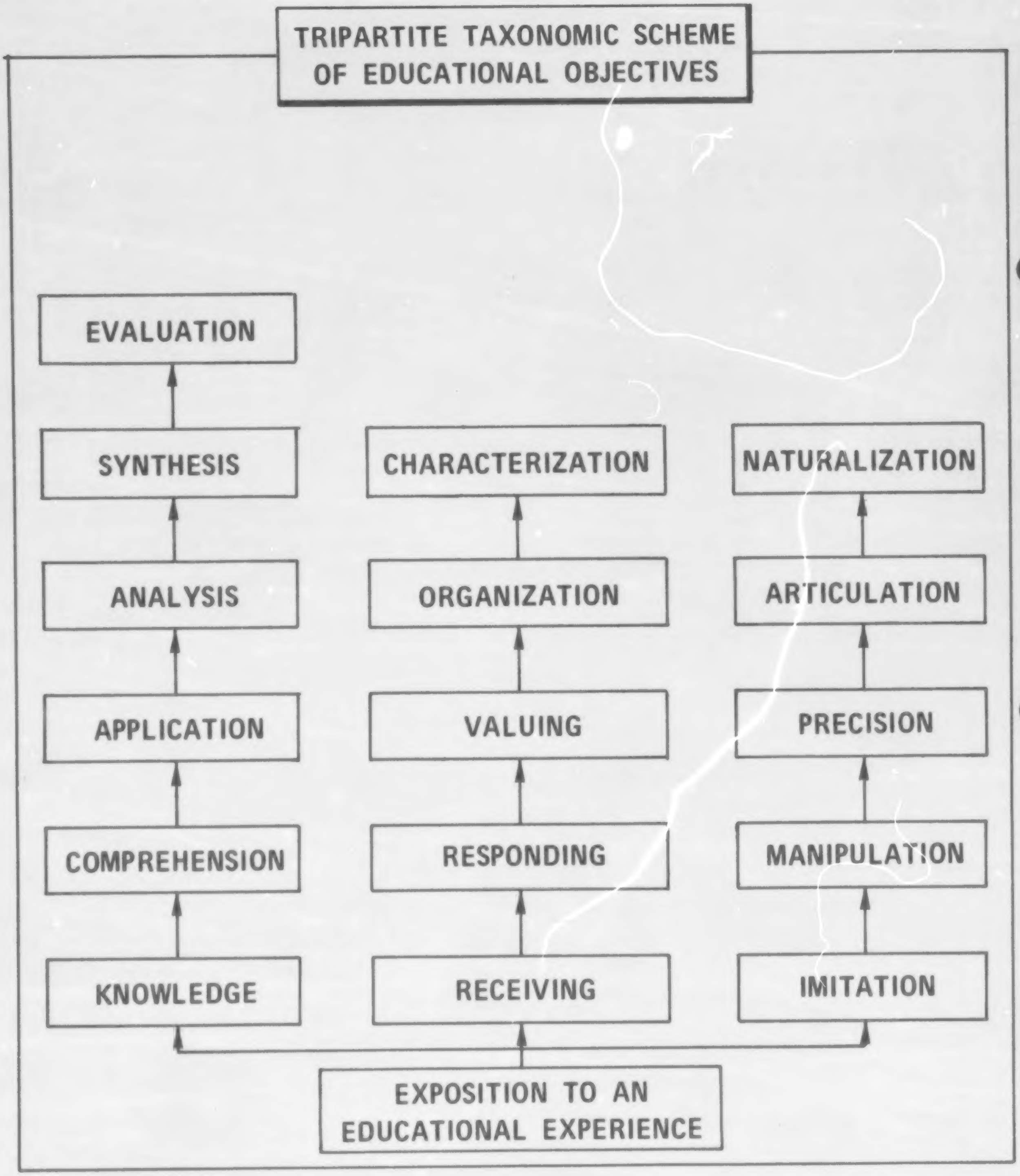
2. CONTROL

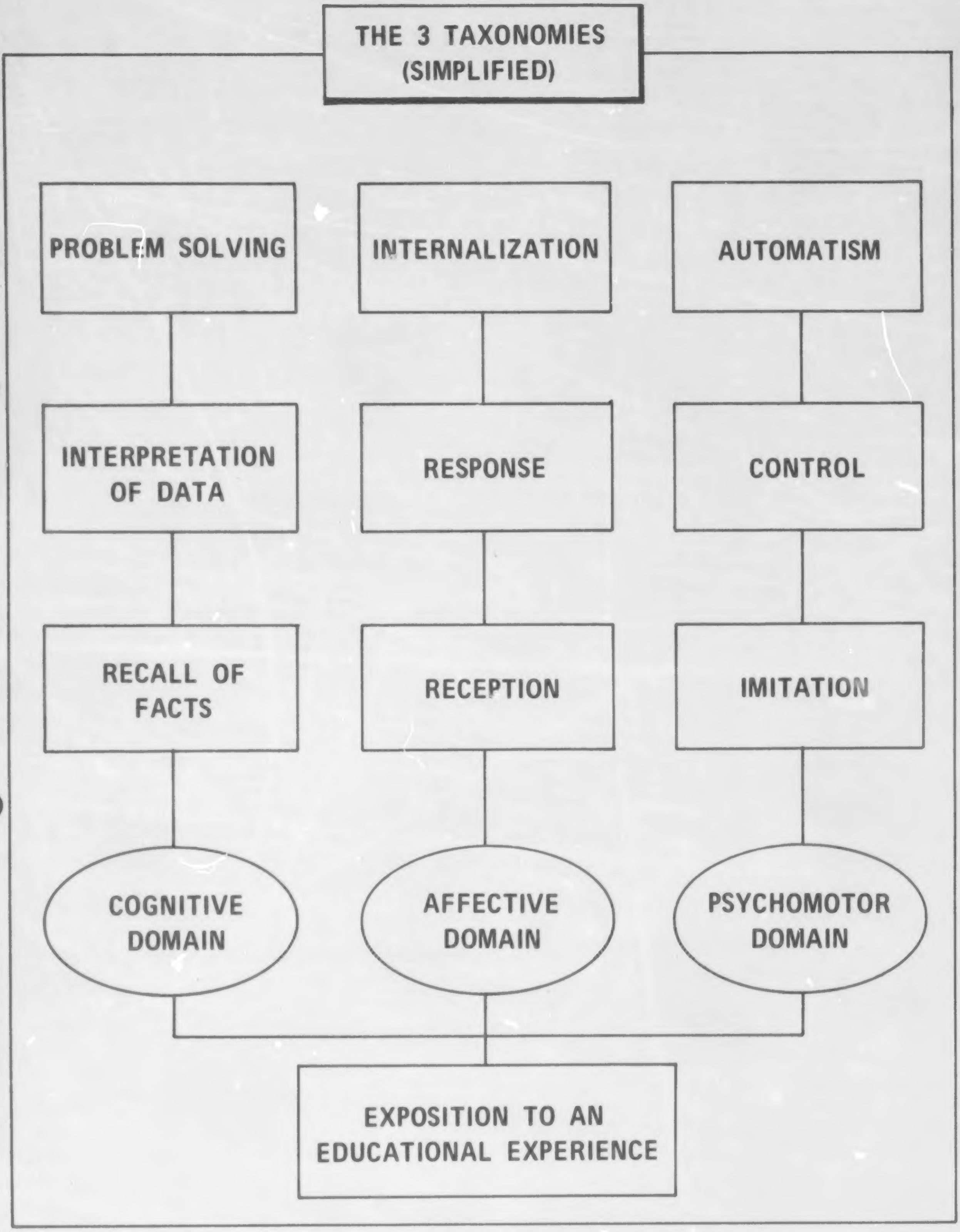
↓

3. AUTOMATISM

## TRIPARTITE STRUCTURE

The complete plan of classification applied to educational objectives comprises three taxonomies, represented by the following diagram:


TRIPARTITE TAXONOMIC SCHEME OF EDUCATIONAL OBJECTIVES
EVALUATION
SYNTHESIS
ANALYSIS
APPLICATION
COMPREHENSION
KNOWLEDGE
CHARACTERIZATION
ORGANIZATION
VALUING
RESPONDING
RECEIVING
NATURALIZATION
ARTICULATION
PRECISION
MANIPULATION
IMITATION
EXPOSITION TO AN EDUCATIONAL EXPERIENCE


THE 3 TAXONOMIES (SIMPLIFIED)
PROBLEM SOLVING
INTERNALIZATION
AUTOMATISM
INTERPRETATION OF DATA
RESPONSE
CONTROL
RECALL OF FACTS
RECEPTION
IMITATION
COGNITIVE DOMAIN
AFFECTIVE DOMAIN
PSYCHOMOTOR DOMAIN
EXPOSITION TO AN EDUCATIONAL EXPERIENCE

**NOTE:** Please remember that in human behaviour the 3 domains are intricately connected.

IF YOU WANT MORE DETAILS ON HOW TO FORMULATE OR TO ASSESS EDUCATIONAL OBJECTIVES REFER TO

Criteria for the evaluation of learning objectives in the education of health personnel. Report of a WHO Study Group. World Health Organization Technical Report Series, 1977, No. 608 (ISBN 92 4 120608X). 47 pages. Price: Sw.fr. 6.-, US$ 2.40. French, Russian and Spanish editions in preparation.

How can a medical school, or indeed any school that trains health workers, ensure that the education it offers will be suited to the needs and demands of the population to be served by its graduates? One well-known but still insufficiently used tool for ensuring this kind of relevance is the learning objective, also called the educational objective. To take the definition used in a recently published WHO Study Group report, a learning objective is a "statement describing the expected results of learning experiences as they manifest themselves in student performance or behaviour". The Study Group in question was convened by WHO to discuss the uses of learning objectives in the education of health personnel of all kinds and, more specifically, to draw up guidelines for the evaluation of such objectives.

The guidelines devised by the Study Group inquire about not merely the wording of educational objectives but mainly the manner in which they were developed. Were the objectives developed so as to reflect, for example, the expectations of health care workers and consumers? Does each objective use an action verb that clearly describes what the student must do to show that he has achieved the objective? Is the set of objectives as a whole internally consistent? The guidelines consist of 37 such items. For many items, the user can simply check off one of the printed answers. A space for "remarks" is included under each item.

An annex to the report, based on a working paper prepared by one of the Group's temporary advisers, clarifies what different authors mean by learning objectives, examines the different levels and types of objectives, lists the potential benefits of taking the trouble to formulate objectives, and reviews the data considered necessary in order to derive objectives. There is also a short section on how to word learning objectives properly. The annex concludes with a set of recommendations that were used by the Study Group in developing its guidelines.

The report and particularly the guidelines should be of value to administrators and teachers in schools for health personnel who wish to draw up or evaluate educational objectives for their own use and that of their students.

Now . . . . .

Define nine specific educational objectives concerning a subject with which you are familiar, stating explicitly what you feel the student should be able "to do" at the end of a given course (that he was not able to do previously) and corresponding to the cognitive, affective, and psychomotor domains; make sure, in particular, that they include all the necessary elements (activity, content, condition, criteria)[1] at three different levels.

### 1st level

- cognitive domain

- psychomotor domain

- affective domain

### 2nd level

- cognitive domain

- psychomotor domain

- affective domain

### 3rd level

- cognitive domain

- psychomotor domain

- affective domain

---

[1] Review if necessary the first chapter (pp. 138-148) concerning the quality of a specific learning objective.

## → → → CHECK YOUR RESULTS ✓

Do you feel that each of the nine specific objectives satisfies the following conditions:

Does it correspond to the domain chosen (affective, cognitive, psychomotor), include the four elements: activity, content, condition and criteria, and is it student orientated? If so, put a cross in the corresponding box.

| OBJECTIVE | DOMAIN & LEVEL | STUDENT ORIENTED | ACTIVITY | CONTENT | CONDITION | CRITERIA |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |

You can also make the same analysis concerning the specific objectives cited on page 149.

This "table" is also called a SPECIFICATION TABLE - for more details see page 255.

**EXERCISE** (check your answers on page 172)

Instructions: for each question select one answer.

**Question 1.** An educational objective corresponds to all the following elements EXCEPT ONE. Indicate which:

A. It is sometimes also called a learning objective.

B. It defines explicitly what the teacher should do.

C. It should be the basis for the preparation of a curriculum.

D. It can be institutional or specific.

E. It is defined in behavioural terms corresponding to the tasks to be accomplished.

**Question 2.** Mager stresses the need to define educational objectives in operational terms (description of the behaviours aimed at). Among the following qualities select the one which does not correspond to one of the advantages sought by this technique.

A. It enables the student to evaluate his progress throughout his period of learning.

B. It enables the instructor to choose relevant examination questions.

C. It enables the instructor to make a satisfactory choice of teaching methods.

D. It enables the student to acquire a thorough knowledge of the content, organization and timetable of a course.

E. It enables the student to show clearly, at the end of the course, the acquirement or lack of specific behaviours.

**Question 3.** A specific educational objective has all the following qualities EXCEPT ONE. Indicate which:

A. It clearly communicates an educational intent.

B. It makes objective evaluation possible.

C. It defines a measurable behaviour.

D. It establishes success criteria.

E. It facilitates analysis of functions and tasks.

**Question 4.** Indicate which of the following statements does not correspond to the principles of rational and effective educational planning:

A. Institutional objectives should be defined before selecting a student evaluation system.

B. Institutional objectives should be derived from the objectives of the departments or chairs of a school.

C. Regional health needs should be considered before drawing up an educational system for training members of the health team.

D. Educational objectives should be defined before selecting educational methods and learning activities.

E. National resources and budgetary constraints should be taken into account before defining institutional objectives.

**Question 5.** Indicate which of the following definitions corresponds to the prerequisite level:

A. What the student should be able to do at the end of the curriculum.

B. What the teacher should summarize before every course so as to place all the students on the same level.

C. What level the student should attain in the process of a given educational programme.

D. What the student should be able to do before undertaking an educational programme.

E. None of the above.

**Question 6.** Which of the following statements best corresponds to the educational aim to be achieved:

A. The student is perfectly familiar with the anatomical structure of the thorax.

B. The student is aware of the socioeconomic factors associated with portal hypertension secondary to acquired liver disease.

C. The student describes in writing the various steps of a nursing care plan in relation to the needs of a patient.

D. The student has a thorough knowledge of the differences between a normal and a premature infant.

E. The student has a positive attitude towards patients.

**Question 7.** Indicate which of the following statements best corresponds to the four qualities of an educational objective defined in behavioural terms:

A. The teacher will give five lectures of an hour each to a group of 20 undergraduate students. These lectures will deal with the physiopathological mechanisms of burns.

B. During a simulation exercise, the student will give a brief written definition of the problem (at least 25 words) and list at least three alternative solutions, indicating which he would adopt and giving the reasons for his choice.

C. The student will show his knowledge of the mechanism of the action of aspirin on the subcortical cells.

D. The student will give a written list of at least five of the seven branches of the radial nerve.

E. The student will demonstrate to his teacher, at the patient's bedside, that he has a good grasp of clinical method and a sound critical judgement, without his relationship to the patient suffering thereby.

Questions 8 to 13

There have been numerous classifications of the intellectual process. One of them considers three domains:

1. affective domain
2. psychomotor domain
3. cognitive domain

Using the following code:

A = 1
B = 2
C = 3
D = 1 and 3
E = 2 and 3

indicate the domain(s) to which the following educational objectives correspond:

Question 8. The student should be able to name four new ideas concerning tuberculosis control.

Question 9. The student should be able to measure the head circumference of a newborn infant with a maximum error of 1 cm.

Question 10. The student should be able, when contraceptives are requested by an 18-year-old girl, to give information on the choice of available methods without expressing any moral judgement.

Question 11. The student should be able to avoid giving a guilt feeling to a five-year-old enuretic child.

Question 12. The student should be able to construct, using simple data already tabulated, a histogram including title, coordinates and additional details without any mistake in the curve.

Question 13. The student should be able to prepare a health education poster, given a model and the necessary materials (paper, felt, charcoal, coloured pencils, glue, scissors).

Question 14. Which of the following statements is in contradiction to the theories expounded in this chapter:

A. The change in behaviour resulting from a learning activity is called performance.

B. Final behaviour is the designation of the observable act which will be accepted as proof that the student has achieved a given educational objective.

C. The definition of the objective of a course is a description or summary of the programme.

D. The teaching intent explained by the educational objective indicates what should be the final behaviour of the student.

E. None of the above statements.

## Questions 15 to 20.

Instructions: The following group of questions consists of lettered headings followed by a list of numbered words or statements. For each numbered word or statement select the one heading that is most closely associated with it and blacken the corresponding space on the answer sheet. Each lettered heading may be selected once, more than once, or not at all.

Indicate the equivalent terms:

A. Educational objectives
B. Institutional objectives
C. Performance
D. Specific objectives
E. Minimum level of performance

Question 15. Terminal behaviour.

Question 16. Instructional objectives.

Question 17. Competency objectives.

Question 18. Criterion.

Question 19. Learning objectives.

Question 20. Acceptable minimal level.

* * *

IF YOU GIVE EACH LEARNER A COPY OF THEIR LEARNING OBJECTIVES YOU MAY NOT HAVE TO DO MUCH ELSE.

**MAGER**

WHAT IF IT WERE TRUE?...

## Answers suggested for the exercise
## on pages 167 to 170

| QUESTION | ANSWER SUGGESTED | If you have not found the correct answer, refer once more to the following pages |
|---|---|---|
| 1 | B | 105-106 |
| 2 | D | 106,109, 116-117 |
| 3 | E | 105-106-107,114,138 |
| 4 | B | 106-107,111 120 |
| 5 | D | 105,116,138 |
| 6 | C | 138 to 142 |
| 7 | D | 146 to 148 |
| 8 | C | 105 to 107 and 151 to 163 |
| 9 | B | |
| 10 | D | |
| 11 | A | |
| 12 | E | |
| 13 | B | |
| 14 | C | 108-109, 116-117 |
| 15 | C | 108,138,148 |
| 16 | D | 106.108, 116-117 |
| 17 | A | 106 |
| 18 | E | 108.109, 148 |
| 19 | A | 106 |
| 20 | E | 138 |

## Notice to the reader!

At the cost of some effort you very likely have been able to attain most of the objectives indicated on page 102; this is the first step, and that is why it is very important, but there is still a long way to go. Even to define all the specific objectives of your present teaching will be a long job. And after that you must make sure that they correspond to institutional objectives, whether explicit or not . . . and it would be more reassuring to know that these objectives are definitely related to the health problems of tomorrow's population. Never forget the relevance. This is not all! The most recent studies on the subject seem to show that teachers do not know how to UTILIZE the educational objectives they have defined. Thousands of specific objectives may be defined in vain if they do not subsequently serve as a reference for preparing the educational activities which will result in their being achieved.

Other awkward questions are: do these objectives which you have defined actually correspond to what is really important or do they merely reflect what is (relatively) easy to set out in the form of objectives? Will they really help the students and will the latter be better trained than if . . . etc.

You will be faced with these arguments at some time or other, generally by those who do not make any attempt to define their own objectives or to learn how to use them. Whatever may be the limits and drawbacks of this approach it has the irreplaceable advantage of enabling studies to be made and research to be carried on. In order to reply to the questions mentioned above, and many others, it will be necessary, and this is a matter of urgency, to carry on research whose scientific rigour will increase the credibility of the arguments, theories and hypotheses advanced by "education specialists". For no matter how logical arguments may be, they must be backed by some proof. Consequently any attempt at dogmatism in this field or wish to define objectives at all costs, should be avoided. These extremely necessary studies will call for considerable experimentation.

You can help in carrying out such experiments.

If all this has not discouraged you, go on to the next chapter. Good luck!

* * *

•••DO NOT FORGET!

THE ESSENTIAL QUALITY

OF EDUCATIONAL OBJECTIVES

IS THEIR RELEVANCE

★

# 2

## PLANNING OF TEACHING/LEARNING ACTIVITIES

This second chapter deals with the planning of teaching programmes and learning activities. It attempts to bring out the change which is now taking place, i.e. the tendency to be interested more in what the student receives, perceives and assimilates than in what the teacher presents, gives or does. It shows that this change can be of benefit to all (the teacher continuing to learn and the student taking over part of the teacher's role). It deals with the teaching-learning process as part of a teaching-learning system. It stresses the effectiveness of methods which place the student in an ACTIVE situation. It proposes a collective plan of action for drawing up a curriculum taking into account the (traditional) obstacles to change.

Those with a deeper interest in these problems are strongly advised to consult the following publications:

- Public Health Papers No. 52, WHO, "Development of educational programmes for the health professions", 1973
- Public Health Papers No. 47, WHO, "Aspects of medical education in developing countries", 1972
- Public Health Papers No. 61, WHO, "Educational strategies for the health professions", 1974
- Technical Report Series No. 489, WHO, "Implications of individual and small group learning systems in medical education", 1972
- Technical Report Series No. 521, WHO, "Training and preparation of teachers in schools of medicine and of allied health sciences", 1973

After having studied this chapter and the references mentioned you should be able to:

1. identify the differences between "education", "teaching", and "learning";
2. describe the new trends of the teaching/learning system;
3. cite 10 conditions which facilitate learning;
4. indicate the aims and general methods of teaching;
5. identify at least two advantages and two limitations of certain techniques employed in teaching;
6. select an appropriate teaching technique for facilitating the attainment of an educational objective;
7. draw up an organizational diagram showing what you think can be done to introduce an "integrated teaching curriculum" into your establishment with consideration of constraints and strategies to overcome them;
8. identify which role, as a teacher, you intend to assume in order to facilitate the learning of students for which you are responsible;
9. identify the obstacles liable to be encountered during the setting up of a competency based curriculum;
10. complete a curriculum specification table.

# THE PURPOSE OF TEACHING IS TO FACILITATE LEARNING[1]

The literature on the philosophy of education is rich in theories, which tell a story of timid steps forward, backward leaps and rediscoveries. It would be very gratifying to have a reliable general theory, firmly seated on a scientific basis and making proper allowance for social variables, which could serve as a guide for every teacher and enable him to resolve the "real" problems of teaching the health professions. Unfortunately, such a universally satisfactory general theory does not exist. On the other hand, by means of the systematic approach suggested, hypotheses can be formulated regarding the process of acquiring a satisfactory level of performance that can be evaluated empirically and the choice of learning activities facilitated.

The contemporary trend is to stress the "teaching-learning system" as opposed to the preponderance previously given to teaching alone. There is a tendency to be interested less in teaching than in learning, less in what the teacher presents and more in what the student learns. Lawrence M. Stolurow has criticized what he calls the "communication-learning fallacy" which assumes that the information transmitted to the student is always learned. Doubtless this is obviously fallacious, and known to be so when it is expressed so crudely, but discussions of teaching methods are often still inspired by it and it has even been carried over into the initial stages of research into new methods. Much of this research, by concentrating on problems of the presentation of stimulating materials and utilizing some of the more rudimentary concepts of communications theory, dealt too much with the manner in which information was transmitted to the student without investigating very closely what was learned and by whom, at what speed and, in particular, for what purpose. Understandably, this approach led to a passive attitude towards students' response; the student was seen in a dependent situation, relying upon information directed at him, whether through modern audiovisual communication techniques or the more traditional forms of the lecture and the text book.

Learning, however, is a dynamic and interactive process in which the behaviour and experience of the student are vital components; the student must not only receive but also contribute; his perception of what is happening is just as important as the perception of his teachers and the assessment he makes of the value of a learning activity may be more relevant than that of his examiners. Good conventional teaching, of course, has always sought to take account of the learner, but its structure and methods have greatly inhibited it. The rigid style imposed by large numbers, timetable requirements and the availability of teaching space, by the conventional practices in designing courses and by teaching conforming to an accepted academic discipline, have led to the "teaching" aspect again dominating over the "learning" aspect. If it is accepted that the starting point must be the acquisition of knowledge rather than its communication then we must ask some different questions and intensify our investigation of NON-DIRECTIVE methods. Using the same approach as Jerome S. Bruner we can consider what experiences will motivate the student and enable him to learn, in what ways knowledge can best be structured for a given student or group of students, what sequence and in what form the material can be presented most effectively, what should be the nature and the frequency of rewards or penalties, and how we can gradually lead a student to give less thought to extrinsic rewards than to the personal satisfaction of having achieved a desired degree of skill.

The body of knowledge possessed by a group of teachers or set out in a series of authoritative volumes is the fruit of intense intellectual activity. Teaching a so-called basic science is not a matter of getting the student to memorize it, but rather of helping him to participate in a process that renders the acquisition of a body of knowledge possible. A subject is taught not to produce little living libraries on that subject but rather to get the student to think for himself in accordance with the laws of physics, to consider problems from the same angle as the biologist and to assimilate the process of acquiring knowledge. Knowing is a process, not a product.

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[1] Adapted from Norman Mackenzie, et al. Teaching and learning, Paris, UNESCO, 1970, pp. 44-50.

If the revision and renewal of the programme is regarded as part of the teaching-learning process, a change must also occur in the roles and interrelationships of teachers, students and others who are concerned. The system becomes much more complex than the conventional linear model and it demands much more from those who have to design, manage and operate it. To put it epigrammatically, the teacher becomes a learner himself, and the learner undertakes some part of the teaching role. This is because the teacher learns more about teaching and the student begins to assume a greater responsibility for his own progress. The roles of other participants also change and new roles must be added to the old. Some of the new methods at present under trial, for instance, not only require librarians to emerge from their traditional sphere into a more dynamic type of activity; they also call for the services of highly qualified personnel, such as artists, photographers and technicians, as well as educational technologists and psychologists. In fact, the ecology of a teaching institution changes once its primary function is redefined, namely to facilitate the acquirement of competence by the student.

* * *

In the following pages (207-216) a certain number of definitions, epigrams and lists are proposed whose aim is to serve, where appropriate, as a starting point for reflections or discussions on the methodology of education. These elementary concepts are derived from various systems, and none of them is regarded as embodying an absolute and final truth.

TEACHING:

★★★ INTERACTIONS

between TEACHER and STUDENT

in order to bring

EXPECTED CHANGES IN BEHAVIOUR

OF THE STUDENT

## PURPOSE OF TEACHING

TO HELP STUDENTS TO ⇨

- AQUIRE, RETAIN AND BE ABLE TO USE KNOWLEDGE
- UNDERSTAND, ANALYSE, SYNTHETIZE AND EVALUATE
- ACHIEVE SKILLS
- ESTABLISH HABITS
- DEVELOP ATTITUDES

★

# TEACHING APPROACHES

- TALK TO STUDENTS
- TALK WITH STUDENTS
- HAVE THEM TALK TOGETHER
- SHOW STUDENTS HOW
- SUPERVISE THEM
- PROVIDE OPPORTUNITIES FOR PRACTICE

◆

*

. . . TEACHING METHODS

WHICH PLACE THE STUDENT IN AN

*active*

SITUATION FOR LEARNING

ARE MORE LIKELY TO BE EFFECTIVE

THAN THOSE WHICH DO NOT

G.E. MILLER

# ★LEARNING

. . . A PROCESS

resulting in some MODIFICATION

relatively permanent

of the BEHAVIOUR,

way of THINKING,

FEELING,

DOING,

of the LEARNER

★

## THE CHARACTERISTICS OF LEARNING ARE THAT LEARNING IS:

1) Producing a behavioural change in the learner

2) Leading to a relatively permanent change

3) Resulting from practice and repetitions

4) Not directly observable

*

# SOME PRINCIPLES OF LEARNING

*

1. Learning is individual

2. Motivation is the key

3. Relevance of learning experience should be clear to the student

4. "Feedback" to learner is important

*

# CONDITIONS to facilitate LEARNING →

... AN

ATMOSPHERE

WHICH

* encourages people to be ACTIVE

* emphasized the PERSONAL nature of learning

* accepts that DIFFERENCE is desirable

* recognizes people's RIGHT to make mistakes

* tolerates IMPERFECTION

* encourages OPENNESS of SELF and TRUST in SELF

* makes people feel RESPECTED and ACCEPTED

* facilitates DISCOVERY

* puts emphasis on SELF EVALUATION in COOPERATION

* permits CONFRONTATION

**

G.P. Pine & P.J. Horne, Principles and Conditions for Learning
in Adult Education – Adult Leadership. Oct. 69

# LEARNING

- is primarily controlled by the learner
- is unique and individual
- is affected by the total state of the learner
- is cooperative and collaborative
- is an evolutionary process
- is a consequence of experience
- is not directly observable

G.J. PINE & P.J. HORNE (ibid.)

## Exercise

1 - Complete in less than five lines the following sentence:

"I learn best when I ..............................................................

.......................................................................................

.......................................................................................

.......................................................................................

.......................................................................................

2 - Ask several colleagues to do the same exercise; put all the "situations" on the same list.

3 - Note the diversity of situations and compare it with that of the educational institution to which you belong.

## NOTE CONCERNING THE PREPARATION OF "TRANSPARENCIES"

Certain pages of the Handbook are printed in large type and can be used as matrices if you should wish to make your own "transparencies" for projection using an overhead projector. There are different methods, depending on the photocopying equipment available.

In general, all you need do is to place a sheet of transparent, thermosensitive acetate film on top of the Handbook matrix[1] and put the whole in the photocopying machine. In a few seconds you will have a transparency ready to be projected on your overhead projector.

Please follow the instructions applying to the particular photocopying machine available to you.

---

[1] You can obtain them by removing the staples from the Handbook and placing the sheets in a ring-file.

## TEACHING TECHNIQUES

The Handbook does not give detailed descriptions of the different teaching techniques employed in centres for training health personnel. This is intentional, for an abundant literature is available on these subjects to which the reader is referred (see references). Another reason is that the main purpose has been to stress the relevant aim of the teaching (whence the almost obsessional insistence on the need to define educational objectives) (chapter I) and on the means for checking if and how these aims have been achieved (chapters III and IV). The problem is not merely one of COMMUNICATING better (this is the subject of chapter II) but of better communicating a RELEVANT MESSAGE.

*

As a teaching technique WORKSHOPS are certainly a very useful and efficient one. For details see chapter 5.

*

## TEACHING TECHNIQUES

For details concerning teaching techniques, lectures, seminars, tutorials, practicals, programme learning, etc., the reader should refer to the specialized publications (see references, page 515 *et seq.*). The following references are also suggested among the documentation cited on page 202.

- The lecture method of instruction - Eileen Bughman
  Public Health Papers No. 52, WHO, pp. 57-63.
- Audiovisual aids to learning - E. B. Penta & T. V. Telder
  Public Health Papers No. 52, WHO, pp. 40-51.
- The selection of teaching/learning materials in health sciences education.
  Technical Report Series No. 538, WHO.
- Techniques to implement a course design model (Unit C of) "Systematic Course Design", A. SEGALL, John Wiley & Sons, 1975.
- Teaching and Training methods for management development
  ILO Geneva Third impression, 1974.

## ADVANTAGES AND DISADVANTAGES OF CERTAIN TEACHING METHODS

| | ADVANTAGES | DISADVANTAGES |
|---|---|---|
| ★ Lectures (1) | - Apparent saving of time (for the teacher) and resources<br>- Presence of the teacher (showmanship)<br>- Covers a large group of students<br>- Gives feeling of security<br>- Enables a large amount of information to be presented | - Keeps the student in a passive situation<br>- Does not facilitate learning problem-solving<br>- Offers hardly any possibility of checking learning progress<br>- Does not allow for individual pace of learning<br>- Low receptivity |
| ★ Practical work (2)<br>★ Bedside teaching (3)<br>★ Field work (4) | - Puts the student in an active situation<br>- Covers a limited group of students<br>- Permits evaluation of degree to which educational objectives have been attained<br>- Develops qualities of observation and decision-taking<br>- Ensures closer contact with reality (professional, health situation of country, colleagues and teachers)<br>- Permits comparison between reality and theory<br>- Enables student to develop self-confidence<br>- Increases variability | - High personnel costs<br>- Sometimes puts the patient in a difficult situation<br>- Poor standardization<br>- Narrow limits of utilization |
| ★ Small group activities (5) | - Permits a teacher/student dialogue (thanks to the availability of the teacher)<br>- Facilitates evaluation | - High costs in personnel and time |
| ★ Programmed learning (from books) (6) and<br>★ simulation (7) | - Enables student to work at his own pace<br>- High efficiency<br>- Facilitates self-evaluation<br>- Permits mass teaching<br>- High availability<br>- Facilitates decision-taking (solution) of complex problems<br>- Decreases risk (for patient or society) | - Necessitates special educational competence<br>- High additional investment costs (in teachers' time and money)<br>- No group dynamics |

**EXERCISE**

From the seven techniques indicated on page 221, choose the one (or ones) which you feel appropriate for each of the 14 specific objectives mentioned on page 149

| Objective | Technique | Constraints to be overcome locally |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |

Also indicate the constraints which exist in your teaching situation and which are an obstacle to the application of the technique selected.

## ADVANTAGES AND LIMITATIONS OF DIFFERENT MEDIA

For convenience of use, the list of media is divided into three main groups; non-projected, projected and sound. The "projected" group is further subdivided into still and moving pictures: the "sound" group refers to sound alone (most of the moving picture group incorporate sound).

### I. Non-projected media

| Media | Advantages | Limitations |
|---|---|---|
| A. Books, handouts and other printed matter | 1. Some learn best through reading.<br>2. Allows self-pacing.<br>3. Good for reference and revision.<br>4. Handouts easily produced, duplicated, revised, for large number of students; can also be associated with teaching to reduce need for notes; can be reproduced in local languages. | 1. Published textbooks expensive, and sometimes involve foreign currency problems.<br>2. Published textbooks rapidly out of date and only revised rarely.<br>3. Good manuals and handouts demand good typing and reproducing facilities. |
| B. Real objects and specimens | 1. Present reality, not substitutes.<br>2. Three dimensional.<br>3. Permit use of all senses in study. | 1. May not be easily obtainable.<br>2. Inconvenience of size - danger in use.<br>3. Costly or not expendable.<br>4. Usually only usable in small groups.<br>5. Sometimes easily damaged.<br>6. Problems in storage. |
| C. Models and simulation devices | 1. Three dimensional and concept of reality.<br>2. Size allows close examination.<br>3. Good for magnified situation (e.g. middle ear mechanism).<br>4. Can be used to demonstrate function as well as construction.<br>5. Can permit learning and practice of different technique.<br>6. Some can be made with local material. | 1. Craftsmanship required for local construction.<br>2. Simulation models often expensive.<br>3. Usable for small groups.<br>4. Models often easily damaged.<br>5. Never same as performing technique on a patient. Beware wrong learning. |
| D. Graphics (charts, diagrams, schematic drawings) posters, paintings, photographic prints | 1. Promote correlation of information.<br>2. Assist organization of material.<br>3. Photographs nearer to reality than drawings, but association often valuable.<br>4. Usually easily produced and duplicated (black and white photos).<br>5. Easy to store, catalogue and retrieve. | 1. For small audiences only (unless projected with epidiascope).<br>2. For effective use, good duplicating equipment and trained staff needed. |

| Media | Advantages | Limitations |
|---|---|---|
| E. Chalkboard (blackboard) | 1. Inexpensive, can be made locally.<br>2. Usable for wide range of graphic representation.<br>3. Allows step-by-step build up, or organization of structure or concept. | 1. Back to audience.<br>2. Audience limited to 50 or so.<br>3. Careful drawings erased not preserved for future use.<br>4. (Considerable skill required for effective use - rarely taught to teachers.) |
| F. Flannelboard (flannel-graph). Note most comments also refer to magnetic board | 1. May be used repeatedly.<br>2. Usually preparable from locally available materials.<br>3. Good for showing changing relationships.<br>4. Hold attention if well used.<br>5. Can be adapted for group participation. | 1. For limited audience only.<br>2. Difficult technique to use convincingly. |
| G. Field trips (not strictly media, but useful as a comparison of factors) | 1. Observation of a participation in reality.<br>2. Opportunity for cooperative group work and sharing responsibilities.<br>3. Good method for individual motivation. | 1. Costly in time and transport.<br>2. For limited audience only.<br>3. Requires careful planning for effect.<br>4. Distractors cannot be controlled. |
| II. Projectable media | | |
| A. Still pictures<br>a. Opaque projection (epidiascope). This is equipment based method only as all materials selected from previous section I | 1. Enlargement of drawn or printed materials for large audiences.<br>2. Obviate need for producing slides and transparencies.<br>3. For transferring enlarged image to chart or blackboard for copying.<br>4. For projection of small objects and specimens. | 1. Demands total darkness for clear projection (except with very expensive models).<br>2. Bulky machine, difficult to transport.<br>3. Electricity required. |
| b. Transparencies for overhead projection | 1. Projectable in full day light to large audiences.<br>2. Presented facing audience<br>3. Relatively easy to prepare with local materials.<br>4. Subjects can be drawn in advance or developed by stages with the group.<br>5. Can demonstrate movements, processes, etc. with perspex models. | 1. Electricity required.<br>2. Equipment and materials for making sophisticated transparencies expensive.<br>3. Not usually suitable for photographic material due to cost (although adaptor available to take 35 mm slides).<br>4. Usually restricted to teacher use, as it is not easy to adapt for the learner to use. |

| Media | Advantages | Limitations |
|---|---|---|
| c. Slides and filmstrips. | 1. Suitable for large audiences.<br>2. Relatively easy production and (in black and white) reproduction.<br>3. Cheapest current form of visual.<br>4. Easily adaptable to self-instructional units.<br>5. Equipment available for viewing or projection without electricity source. | 1. Fixed order of frames in filmstrip restrictive in use.<br>2. Need partial darkness for viewing unless rear screen or day light screen used.<br>3. Duplication of colour slides expensive (even impossible in many countries). |
| d. Microfiche | 1. Easy storage and cataloguing of large numbers of visuals.<br>2. Exchange of information on available collections.<br>3. Very cheap per image if projection can be assured for large groups.<br>4. Small and light for easy despatch. | 1. Too small for clear naked-eye viewing.<br>2. Although inexpensive equipment available for individual use, large group projection equipment not readily available.<br>3. Electricity required, except when hand viewers used. |
| B. Moving pictures<br>a. Films (comments include reference to both 16 mm and 8 mm formats) | 1. Close to reality with movement and sound.<br>2. Suitable for large audiences (16 mm) - for small groups only (8 mm).<br>3. Compression of time and space.<br>4. Emotive, can develop attitudes, pose problems, demonstrate skills.<br>5. 8 mm loops useful for individual instruction.<br>6. Good learning source if preceded by teacher's introduction followed by discussion. | 1. Does not permit self-pacing.<br>2. Films costly and difficult to produce.<br>3. Individual films relatively expensive.<br>4. Electricity required.<br>5. Equipment difficult to transport.<br>6. Darkness for viewing (except rear screen use).<br>7. Imported film may contain inappropriate information (see proviso in advantage 6). |
| b. Broadcast (open circuit) television | 1. Adaptable to large and small audiences in widely distributed area.<br>2. Capable of gaining and maintaining attention.<br>3. Can stimulate emotions, build attitudes and develop problems.<br>4. Can conserve resources of instructors by simultaneous broadcast to many classes. | 1. Programme expensive to produce and demands highly skilled staff.<br>2. Receiving equipment expensive and difficult to maintain.<br>3. Electricity required.<br>4. No immediate interaction or feedback.<br>5. Learner must adapt to fixed schedule, never the other way round. |

| Media | Advantages | Limitations |
|---|---|---|
| c. Closed circuit television and videotape (including video-cassettes) | 1. Adaptable to medium and small audiences.<br>2. Videotape repeatable to fit learning schedules.<br>3. Film advantages 1, 3 and 4 apply (see above).<br>4. Valuable for magnification of image, recording intimate situations, micro-teaching, recording of developments in clinical syndromes or in scientific experiments, "bringing the village into the classroom", recording emergencies, etc.<br>5. Portable equipment can function on battery for field recording. | 1. High initial cost of production equipment, and requirement of trained staff.<br>2. Electricity required. Although portable works off battery, this needs charging from power source.<br>3. Receivers are expensive and require maintenance. |
| III. Sound media | | |
| a. Broadcast radio | 1. Adaptable to large and small audiences in widely separated areas.<br>2. Conserves resources of instructors by broadcasting simultaneously to many classes.<br>3. Capable of gaining and maintaining attention.<br>4. Reception equipment relatively cheap and will function on batteries.<br>5. If combined with prepared materials (radiovision) can be improved learning tool. | 1. Special studio facilities and staff required for broadcast (less expensive and complex than broadcast television).<br>2. Learners must adapt to fixed schedule, not other way round.<br>3. No immediate feedback and no audience interaction. |
| b. Sound recording (reel and cassette tape, records/ discs) | 1. Adaptable to any size of audience.<br>2. Especially suited to individual and small group learning.<br>3. Due to stop and playback facilities of tape, can be student paced.<br>4. Cheap, battery operated cassette players available and relatively cheap cassettes.<br>5. Many uses - to provide sound for slide sequences, for micro-teaching, heart sounds, for posing problems, etc. | 1. Use for individual learning demands many playback units.<br>2. Good quality recording: demands studio facilities. |

# OBSTACLES TO CHANGE

- DYNAMIC CONSERVATISM
- INSTITUTIONAL BUREAUCRACY
  BUILT-IN RESISTANCE TO CHANGE
- COMPLEXITY OF CURRICULUM CHANGE
- LACK OF INSTITUTIONAL RESOURCES
- LACK OF MODEL UPON WHICH TO BASE A CURRICULUM CHANGE

J. BRYANT

# THE
# FOUR C'S
# OF CURRICULUM PLANNING

➡ COOPERATIVE

➡ CONTINUOUS

➡ COMPREHENSIVE

➡ CONCRETE

★

## PROGRAMME

describes:

A SERIES OF PLANNED EDUCATIONAL ACTIVITIES A STUDENT IS TO GO THROUGH WITH THE ASSISTANCE OF TEACHERS

## INTEGRATION

( of a curriculum)

. . . COORDINATION OF DIFFERENT TEACHING/LEARNING ACTIVITIES TO ENSURE THE HARMONIOUS FUNCTIONING OF THE EDUCATIONAL PROCESS FOR MORE EFFECTIVE TRAINING

★★★

## PLAN OF ACTION FOR PREPARATION OF A TEACHING PROGRAMME

| Chronological order | Definition of objective | Executing body | Advisory body |
|---|---|---|---|
| 1 ↓ | Prospective study to evaluate the country's requirements (quantitative and qualitative) in respect of health personnel, taking into account what is available and can be absorbed | Ministries of Planning, Health, Education, etc. | University staff, national and international experts |
| 2 ↓ | Definition of the educational objectives of the school of health sciences in accordance with the tasks to be accomplished by each professional health worker | Ministries of Education and Health | Special faculty commission |
| 3 ↓ | Organization of an information group on education planning for health sciences | Faculty staff | Department of Education<br>Education consultant |
| 4 ↓ | Acceptance by the faculty staff of the goals established in the light of the country's requirements; training of teachers (education) | | |
| 5 ↓ | Modification of teaching programme and selection of methods by which to attain the goals | Faculty staff (Curriculum committee) | Faculty staff<br>Education consultant |
| 6 | Development of a system of evaluation:<br>- final examination (cumulative)<br>- partial examination (formative) indicating whether the goal has been attained | Evaluation Committee | Department of Education<br>Education consultant |
| 7 ↓ | Organization of a group for research in education | Faculty staff | Department of Education |
| 8 ⤴ | Periodic re-evaluation of goals and methods in response to changes in the country's needs and in the light of evaluation | Ministries of Planning, Health, Education, etc. | University staff, national and international experts |

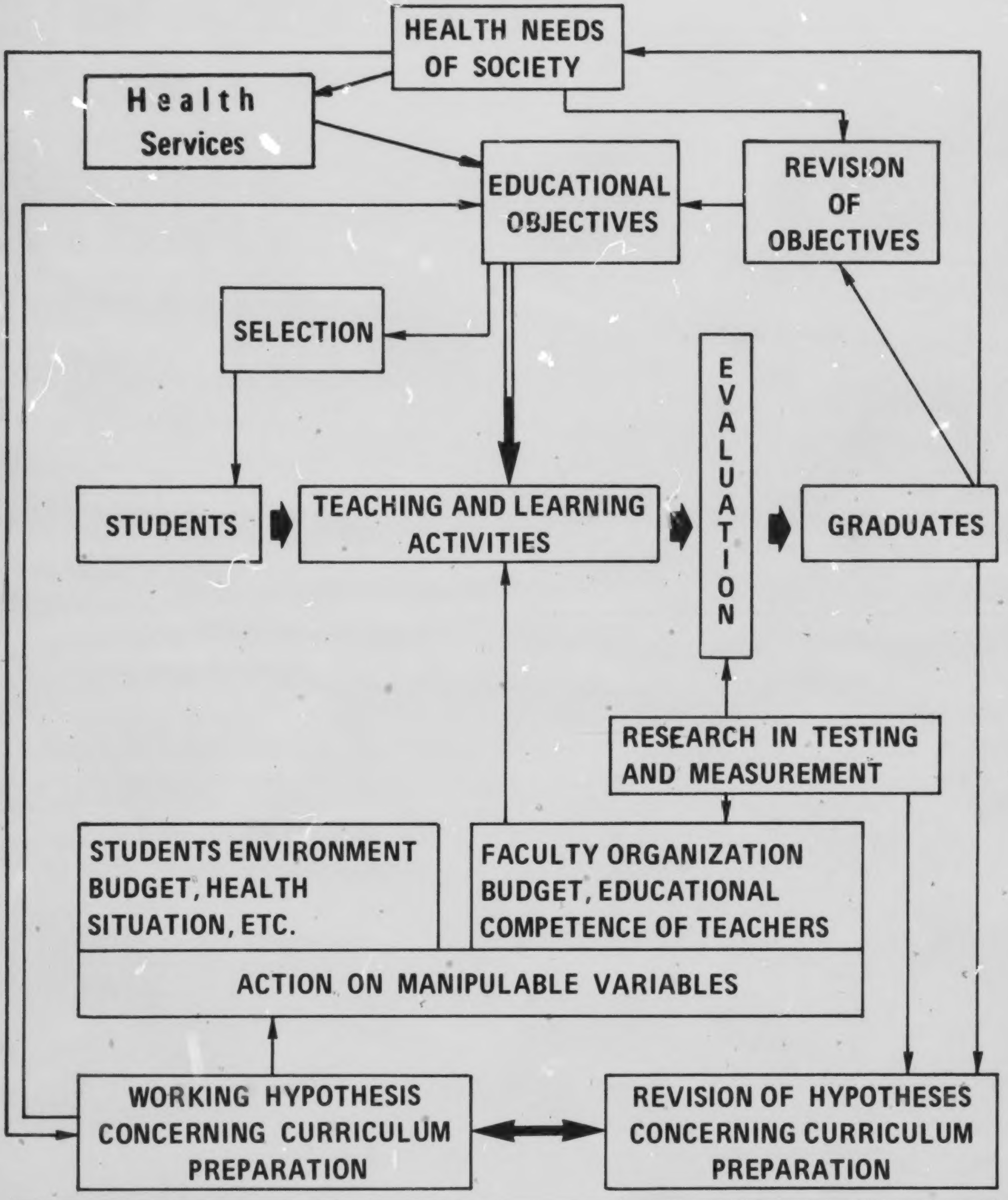
HEALTH NEEDS OF SOCIETY
Health Services
EDUCATIONAL OBJECTIVES
REVISION OF OBJECTIVES
SELECTION
EVALUATION
STUDENTS
TEACHING AND LEARNING ACTIVITIES
GRADUATES
RESEARCH IN TESTING AND MEASUREMENT
STUDENTS ENVIRONMENT BUDGET, HEALTH SITUATION, ETC.
FACULTY ORGANIZATION BUDGET, EDUCATIONAL COMPETENCE OF TEACHERS
ACTION ON MANIPULABLE VARIABLES
WORKING HYPOTHESIS CONCERNING CURRICULUM PREPARATION
REVISION OF HYPOTHESES CONCERNING CURRICULUM PREPARATION

DIAGRAM SHOWING FACTORS INFLUENCING CURRICULUM DESIGN

# THE CONCEPT OF INTEGRATION IN EDUCATION AND TRAINING

## 1. DEFINITION

Integration (from the Latin integer = whole) means coordination of different activities to ensure harmonious functioning.

This definition suggests that the result of harmonious functioning will be greater efficiency. In our materialistic world efficiency is a dogma. In the developing countries it is the key to survival. Neither the idea nor the word is new. At present both are fashionable and, as is often the case in such situations, infatuation and passion are more in evidence than logical analysis and objective appraisal. Such things are used, abused, transformed and deformed.

The password is "integration". What is integration?

Let us start by saying that we shall not be considering here "integrated medicine", "integration of basic health services" or "integration of the health team". The concept is certainly the same but used in the field of a philosophy of public health, of the deployment of services and of human resources.

We are concerned here with the meaning of integration in the more limited field of education and training. To paraphrase the definition given above, integration in this field is the coordination of different teaching activities to ensure the harmonious functioning of the educational process for more effective staff training.

## 2. THE PURPOSE OF INTEGRATION

Before the era of the mega-universities with thousands of students and before the era of specializations stemming from a technology ramifying in all directions, medicine was learned with the patient in direct contact with the professor - a natural source of integration. During training, there were of course several professors and the student, second natural source of integration, assimilated, analysed and synthesized the information.

Since the beginning of the twentieth century, the university-factory, the numbered and card-indexed student, and the super-specialists have made their appearance. Fundamental and staggering scientific discoveries are being made faster than text-books are revised and reissued. Research laboratories are draining away and absorbing funds intended for training centres. Teachers engage in research since their future depends on the results they obtain in their field. Without organized teacher-training, they are entrusted with students who are not supposed to appraise their performance. Reputation depends on the number of publications rather than the quality of the doctors trained. Theoretically the doctor, once trained, is a complete and integrated element. In practice, he is the outcome of a non-integrated training lacking in human feeling.

Human feeling, the concept which should inspire students and teachers, should be concerned with improving the health of the people and should be the basis of the educational objectives of the university centres for health sciences. These objectives, shared by a group of physicians with teacher-training, will be more easily attained if the various teaching activities function harmoniously, hence the need for integrated teaching.

## 3. ADVANTAGES OF INTEGRATED TEACHING

This method has several advantages:

### Synthesized presentation

In traditional teaching the cardiovascular system, for instance, is dealt with separately and sometimes conflictingly by the anatomist, the histologist, the embryologist, the physicist, the physiologist, the biochemist, the microbiologist, the pathologist, the physician, the surgeon, the pharmacologist, the medico-legal specialist and others. Each specialist tackles the subject by reviewing what he thinks the others did, for the obvious reason that the student has already forgotten it. He treats the subject from the standpoint of his specialty with all the details that it involves. The student listens, repeats and forgets while waiting for the next lecture. He has neither the knowledge, the experience, nor the time to synthesize the various fragments presented to him.

The cardiovascular system will be remembered according to the most vivid presentation. In integrated teaching, coordination is carried out by the teachers in advance.

### Reduction of pointless repetition

Reminders, over-elaboration and contradictions not only confuse the student but also waste his time.

### Presentation in a logical order

In traditional teaching, the lack of coordination has often meant that the physiology of an organ is dealt with one year and its anatomy the following year. Or the clinician presents the etiology of a disease before the microbiologist has been able to described the organism responsible for it.

### Reduction of non-essential details

Preliminary discussion by the different teachers of a specialty automatically results in the pruning and balancing of a subject in line with the common objective.

### Improvement of the quality of teaching and teachers

This is achieved, if for no other reason, by the process of emulation which always occurs when several specialists who are normally isolated find themselves working side by side.

### Improvement of relations between the departments through preparatory meetings

Better utilization of teachers who are no longer restricted to their own departments but can assist with a teaching function whenever they have the necessary capacity.

## 4. APPLICATION OF THE CONCEPT OF INTEGRATION ACCORDING TO THE TEACHING METHOD

### Theoretical instruction

At the outset, let us exclude from our discussion the traditional lecture. It should be a collective information session on a subject not dealt with in texts. Then it may have a stimulating and catalysing quality. As it is it belongs to the realm of propaganda, magic and exorcism, not of integration.

However, discussion in small groups on the lines of the tutorial, accompanied by a case study, presentation of patients or a demonstration, clearly corresponds to the concept of integration.

The same is also true of clinico-pathological or clinico-social lectures.

### Practical instruction

Clinical practice at the patient's bedside is a form of instruction which also benefits from the presence of different specialists (clinician, epidemiologist and basic sciences specialist).

Laboratory exercises. This is certainly the field in which integrated teaching has made its greatest contribution in the form of a multidisciplinary student laboratory. It is in such laboratories that the basic principle of the Western Reserve reform had its best practical application - teaching centred around the student. The earliest plans date back to 1948. Since then many medical schools (almost all those planned after 1960 in the United States of America) have set up suitably adapted laboratories.

The essential aim is as follows: to give each student an individual work area in which all practical laboratory work is done. The student is also given his own study, which is open to him 24 hours a day, in which he can keep his books, microscope, etc. This is a facility that was previously limited to postgraduate students. Finally, the aim is to ensure, from the standpoint of laboratory staff and logistics, economic coordination and centralization. The students are generally grouped in modular units of 16 places as in the universities of Brasilia, Southern California, Florida and Kuala Lumpur, although this arbitrary figure is neither historically based nor essential. It is also possible to establish units of eight students as at Einstein or of 24 as at Harvard: in the original multidisciplinary laboratory at Western Reserve there were 80 students in one room. Aesthetic reasons and the desire to give the student a less community-type atmosphere have in most cases led to the choice of modular units of 16. The teachers in the various fields come to the laboratory, according to an established programme, to present the exercises as scheduled, using apparatus set up in advance. The multidisciplinary laboratory is run by a director responsible for coordination with the different departments concerned. He is generally a basic sciences specialist chosen for his tact and wide interests.

Experience in the matter has amply demonstrated some of the advantages of multidisciplinary laboratories over departmental laboratories. The students appreciate having a place in which to work in the right atmosphere. The teachers recognize that their teaching has greater effectiveness in less space and at lower cost. In short, the advantages of the multidisciplinary laboratory are that it:

- gives the students a fixed working base;
- eliminates movements of students from one laboratory to another;
- makes for effective teaching;
- permits a saving in building space;
- avoids duplication of equipment;
- permits more rational use of teachers.

## 5. STAGES AND PRECAUTIONS

Universities which have succeeded in applying a system of integrated teaching have done so by stages.

However sound an idea, for successful implementation it must be presented, tried out and defended by someone who is determined, competent and sufficiently diplomatic not to make more enemies than friends.

The administrative structure must be modified so as not to present any obstacles to the concept of integration.

A committee (department or unit) of information and research in medical education is an essential instrument for promoting the concept of integration.

There should be total separation between the planning of teaching on the one hand and the allocation of funds (general or research) and appointment of teachers on the other. The traditional view that the more teaching hours a department has the more important it is (and hence deserves more staff and funds) leads to anti-educational decisions.

## 6. CONCLUSION

The advantages of integrated teaching(specially if competency based) seem so evident that they raise the question why, after 30 years of positive experience, it is still necessary to promote it so strongly? If it is so good, why have all the new medical schools not joined in the movement? Why have the older medical schools not modified their curricula in favour of an integrated system? One answer is that in the university world in general and the medical sector in particular, individualism, academic self-sufficiency, caste attitudes, a superiority complex and conservatism are stronger than the desire for coordination, concerted action, participation, modesty of outlook and new ideas. Mental inertia is as difficult to overcome as all types of inertia. We shall have to rely on patience, optimism and the slow, long training of those who will eventually take over.

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THE MAIN PITFALL OF THIS CONCEPT IS THAT IT IS TEACHER ORIENTED.

IF YOU ARE MORE INTERESTED BY A STUDENT ORIENTED CURRICULUM,

SEE PAGES 245-252

# PLANNING CURRICULAR CHANGE IN ORDER TO INTRODUCE AN INTEGRATED CURRICULUM

## 1. PREFACE

A key component of educational reform and innovation is the organization modification needed to plan and implement the desired changes. In other words, how will the organization be modified to facilitate change? Who is to do what and in what sequence? Is the completion of some tasks pre-requisite to beginning others? What supporting actions need to be taken and what resources need to be made available in order for the change to take place in an orderly and effective fashion?

In order to illustrate some of the planning principles which need attention, the attached planning schedule has been prepared as an example.

## 2. Why a planning schedule

It is designed to help to answer the following questions:

2.1 If a curriculum is designed on the basis of objectives (competencies) to be achieved rather than time to be used, how should this affect the planning process?

2.2 How can a faculty be organized for an "integrated" curriculum?

## 3. Planning schedule concepts

The concepts both explicit and implied in this plan, represent a radical departure from traditional medical school practice. If a school were to shift to the type of system described here, the transition should be regarded as a long-term (perhaps four or five years) project. This suggests that:

3.1 A plan for phasing from the old system to the new one should be developed.

3.2 A series of intermediate objectives should be set with time deadlines.

3.3 The objectives should indicate what parts of the old system should be improved, which elements of the new system should be introduced, and in what sequence.

3.4 The plan should be discussed with the faculty and appropriately revised before becoming institutional policy.

## 4. Sequence of steps

The system proposed is hypothetical and should be used only as a means for beginning work on a system appropriate for your own school.

## A representative sequence of steps for planning and implementing an "integrated" curriculum

| ACTION | TAKEN BY | OBTAIN AGREEMENT FROM |
|---|---|---|
| 1. Curriculum Committee appointed with authority and responsibility to plan and coordinate an integrated curriculum. Members should be selected for creative abilities as well as for distribution among disciplines. Students and perhaps a health ministry representative should be included. | Medical school administration | University administration; major power centres in medical school |
| 2. Institutional objectives are stated in writing in terms of the abilities and attitudes graduates should posess. A statement of general curricular philosophy should be prepared. | Curriculum Committee | |
| 3. Approval of written institutional objectives and curricular philosophy are obtained.<br>Revisions made as needed to obtain agreement with the plan in principle. | Jointly by medical school administration and curriculum committee | University administration; major power centres in medical school; Health Ministry. |
| 4. Select the organizing principles that will be used for planning the integrated curriculum. Examples are:<br>- competency base;<br>- body systems in health and disease;<br>- clinical problems base;<br>- the processes of clinical medicine;<br>- a preventive medicine model; etc.<br>- community problem base | Curriculum Committee | |
| 5. Lay out a general sequence of curricular units in block diagrams or outline form based on:<br>5.1 Curricular organizing principles and philosophy;<br>5.2 Assumptions and data concerning incoming capabilities of students;<br>5.3 Terminal curricular objectives;<br>5.4 Available instructional resources. | Curriculum Committee | Medical School Administration |
| 6. Select the disciplines that should have major representation in each curricular unit. | Curriculum Committee | |

| ACTION | TAKEN BY | OBTAIN AGREEMENT FROM |
|---|---|---|
| 7. Organize Teaching Committees for major teaching units. Critical factors:<br>7.1 Teaching unit chairmen who:<br>(a) understand and support the philosophy of the curriculum;<br>(b) have demonstrated ability to get things done in committees.<br>7.2 Majority of committees are open-minded and willing to break with tradition.<br>7.3 Major disciplines specified in step 6 are represented. | Curriculum Committee | Medical school administion; departmental chairmen |
| 8. Select teaching unit faculties. | Unit committees | Departmental chairmen |
| 9. Begin training sessions for Teaching Unit Committees and Faculty. General Topics:<br>9.1 Philosophy and objectives of curriculum;<br>9.2 Educational concepts and methodology;<br>9.3 Organizational principles essential to the success of the curriculum. | Curriculum Committee - with the assistance of education consultants from:<br>(a) own university<br>(b) other organizations | |
| 10. Teaching unit pre-requisite abilities and terminal objectives (competencies) (department level) are prepared or reviewed by Teaching unit committee. Preferred sequence: begin with last teaching unit prior to graduation and work backward to entry point in curriculum. | Teaching unit committees with guidance from curriculum committee and education specialists | |
| 11. Teaching unit objectives (or plans) are submitted to review and revision process. | Curriculum Committee, school administration, education specialists | |
| 12. Instructional objectives are prepared and reviewed. | Teaching unit faculty, unit committee, education specialists | Department chairmen concerned |

| ACTION | TAKEN BY | OBTAIN AGREEMENT FROM |
|---|---|---|
| 13. Instructional experience and evaluation methods (both immediate and long-term) are planned. Necessary administrative support identified and planned. | Unit faculties under guidance of unit committees and education specialists | Curriculum Committee, chairmen concerned, school administration |
| 14. Instruction and evaluation methods implemented. | Unit faculties under guidance of unit and curriculum committees | Department chairmen |
| 15. Evaluation results collected. Data pertaining to individual student evaluation and evaluation instructions handled separately and processed through appropriate channels. | Unit committee and education specialists | |
| 16. Recommendations for improvements in the system are developed based on evaluation data and other sources of information and advice. | Curriculum Committee, unit committees, school administration | Appropriate individuals and groups |
| 17. Changes are implemented at appropriate points in the system. | Curriculum Committee, unit committees | School administration, department chairmen |

★ ★ ★

### 5. Possible advantages of a systematic approach

5.1 It provides a mechanism making possible a study planned and organized in advance.

5.2 When it becomes really operational it should be more effective than the traditional approach since it can be improved by the feed-back.

5.2.1 If it is well organized, it may permit greater flexibility in organizing the use of time of students and teachers.

5.2.2 Certain individual variations can be foreseen in the rate and mode of progress of students throughout the curriculum.

5.2.3 It may prove possible to train more students at the same cost if the system is carefully structured.

### 6. Possible disadvantages

6.1 Teachers must spend more time on planning and evaluation, especially during the first years following the adoption of the system. In many respects it is more expensive at the outset to try to construct a new system rather than to keep to the old one.

6.2 It seems clear that a nucleus of teachers will have to spend a greater part of their time in planning, managing and evaluating the curriculum. These activities could be organized using a rotation system covering three or four years, so as to distribute the work and give teachers an opportunity to become familiar with the methodology.

### 7. Necessary supporting elements

7.1 A school administration and departmental chairmen willing to delegate some of their responsibility and authority to a new curricular planning and management system.

7.2 Budgeting of funds in a manner consistent with the curricular plan and the distribution of decision-making authority.

7.3 Review and, where necessary, revision of academic reward policies of the school so that faculty contributions to planning and implementation of the curricular system are given high priority when decisions are made concerning salary increments and academic promotion.

7.4 A medical school administration and curriculum committee who are skilled in co-opting, "neutralizing" or "removing" key opponents to the plan on the faculty.

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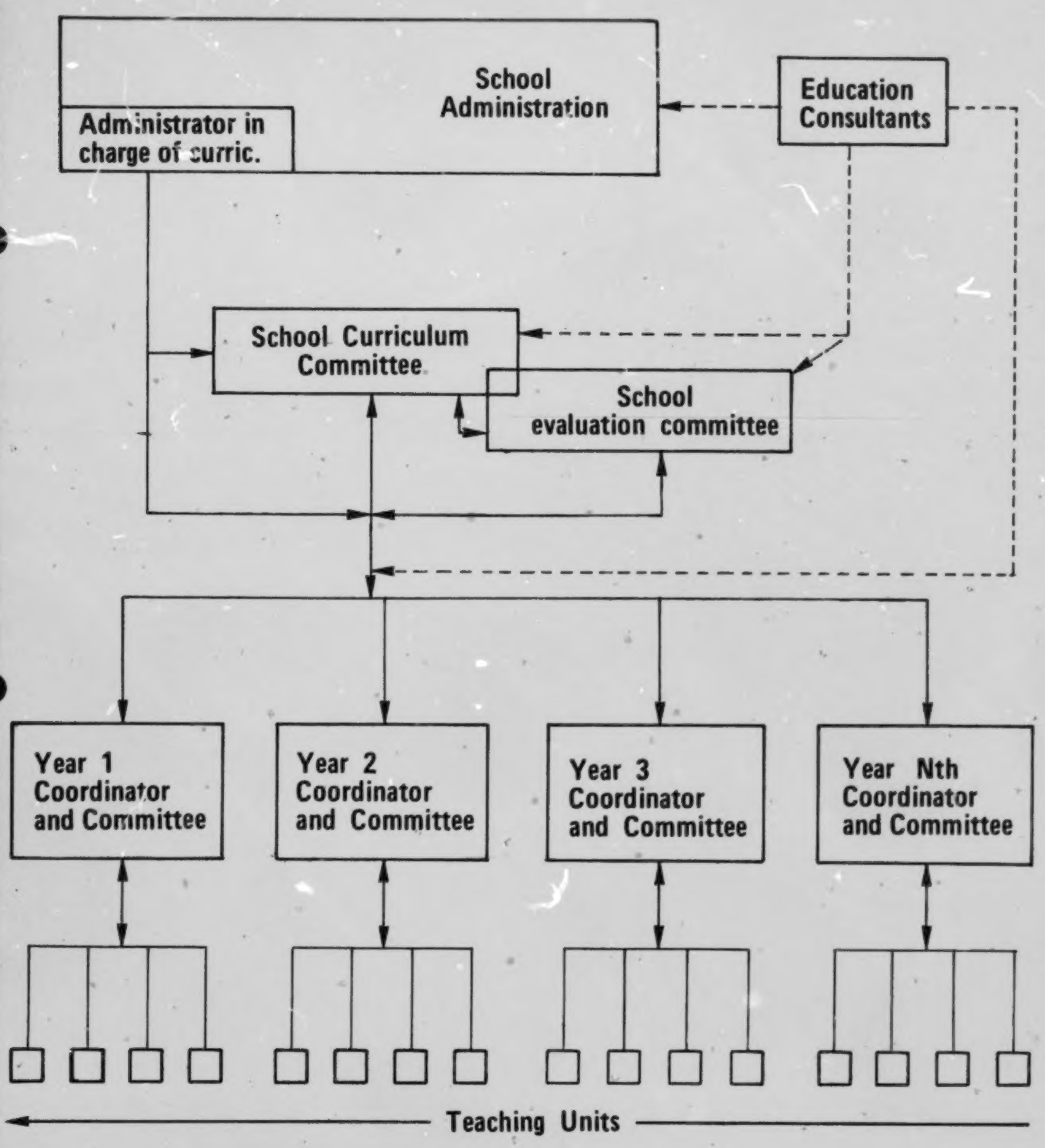
This procedure for introducing integrated teaching was prepared (1971) by Dr J. Hess, Wayne State University School of Medicine, Detroit, Michigan, United States of America

# ORGANIZATIONAL STRUCTURE ASSUMED FOR SIMPLE CURRICULAR PLANNING MECHANISM


School Administration
Administrator in charge of curric.
Education Consultants
School Curriculum Committee
School evaluation committee
Year 1 Coordinator and Committee
Year 2 Coordinator and Committee
Year 3 Coordinator and Committee
Year Nth Coordinator and Committee
Teaching Units

Key: Solid lines represent direct lines of administrative authority.
Dashed lines represent advisory authority.

## Personal notes

## EXERCISE

Show diagramatically the type of organization (commissions, committees, boards, etc., indicating their functions) which you deem feasible (in the establishment where you are teaching) in order to introduce (or improve) integrated teaching for a competency based curriculum . . . . then compare with page 241.

**EXERCISE**

Describe the constraints which you are liable to encounter in implementing the organizational plan you have proposed on the preceding page, showing for each constraint the STRATEGY for overcoming it:

| CONSTRAINTS | STRATEGIES |
|---|---|
| | |

## A LEARNER ORIENTED CURRICULUM with built-in RELEVANCE

In the teaching of health sciences an essential quality of the programme - namely its relevance - has often been neglected by educationalists. The relevance of a programme is the extent to which it facilitates the acquisition of the level of competence and areas of skill necessary for the student to practise his profession. In chapter 1, the basic elements necessary for formulating relevant educational objectives were indicated. It was then stressed that the health needs of populations, together with their available resources, should serve as a basis for such formulation. A further point made was that health planners should define the types of health service organization most suitable for resolving the health problems of a given population as it is within the framework of these services that the individual members of the health team will play their roles, fulfil their functions and accomplish their special tasks. These roles, tasks and functions must also be defined not only in terms of the present expectations and needs of the community but also in terms of the likely future roles, tasks and functions which members of the health team will be expected to fulfil in the future. Consequently prospective definitions are required; such forecasts being dependent on the complexity of the abilities to be acquired and the duration of the training programme. For those professions requiring high levels of competence (physicians, sanitary engineers, etc.) it has not been possible to define the tasks they will have to carry out in 10 years, other than in the form of assumptions which have variable degrees of reliability. Perhaps the developments in the science of futurology will ultimately end in finding solutions for this problem.

Until this is possible, however, other solutions should be envisaged.

A few years ago Laurence Weed suggested a new programme of medical education which attempts to resolve the notorious and difficult problem of relevance. The orginality of Weed's proposal is that it seems to resolve this problem while remaining within the strict framework of training[1] (refer once more to the diagram on page 114) and without making use of prospective data on the organization of the health services. It is for this reason that we are referring to it in this Educational Handbook. We also suggest that the reader consults other specialized works concerned with alternative methods of programme construction.

We shall propose a type of educational programme[2] inspired largely by that of Weed but comprising an orientation closely linked to community rather than individual health problems.

At the outset, it should be mentioned that the definition of educational objectives (at the most general level) should, in all cases involving the training of higher staff, include the following objective: "be able to find solutions for problems arising in new situations". It is here that the basic sciences have an important role to play, assisting the student in the acquisition of a method of work essential for a graduate if he is to keep his knowledge and skills up to date.

### Weed's new programme

The Weed programme is based on a certain number of premises which must be stated first of all, since any disagreement with these premises would probably lead to a rejection of the proposed programme. On the other hand, the mere fact of agreement with the premises does not ensure that the teachers would be willing to accept and apply the new programme since Weed's approach is revolutionary: it requires replacing a whole programme not merely changing parts of it.

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[1] The proposed method can be adapted just as readily to the preparation of the programme for a dentist or a nurse and, by extrapolation, to that for a sanitary engineer, pharmacist or hospital administrator.

[2] Described in his book: Medical Records, Medical Education and Patient Care. Cleveland, The Press of Case Western Reserve University, 1970.

The problem is that the premises seem relatively harmless and such that the most conservative of teachers is prepared not only to support them but even to say that they contain nothing new and that he adopted them a long time ago, or possibly that he has thought of them himself.

## Weed's premises

1. General educational objectives. The student (future physician) must be able to:

   1.1 set his personal goals related to his work within the organized system of medical care, and to develop his own approaches to the achievement of these goals; he must also seek criticism from teachers and fellow students.

   1.2 collect relevant data and utilize that for solutions of the problems.

   1.3 audit his own performance or that of a colleague using carefully established criteria.

   1.4 demonstrate the qualities of professional thoroughness, reliability, sense of analysis and efficiency.

2. Teaching and learning techniques:

   2.1 The student must acquire basic skills (manual and intellectual) and not merely basic knowledge; he must be able to demonstrate that he can do things; the tyrannical role of memory must be reconsidered; long-term memory is usage.

   2.2 He must be able to learn and think independently and to learn from his experience. Every patient can be a source of data, while the teachers should ensure intellectual discipline and value judgement.

   2.3 He should be able to acquire independently, thanks to study of documents and information prepared for the purpose (books, scientific journals, duplicated texts, audiovisual aids, etc.), everything that is usually transmitted by traditional lecture•courses, provided that the educational objectives are known to him and formative evaluation exercises constructed on the basis of the objectives.

   2.4 He should acquire his professional competence through the practice or real professional acts of increasing difficulty, compatible with his level.

   2.5 Practice in a controlled environment may lead to the revelation of basic principles.

   2.6 A function of the teaching institution should be to help students find solutions for a diversity of new problems and make them able to carry on once the problem to be solved has been defined.

3. Organization of studies:

   3.1 The quality of achievement and acceptable performance for a given task should be regarded as a constant. What can vary is the number of types of tasks that a given health professional should be able to accomplish.

   3.2 The length of study programmes should not be regarded as a constant. It is preferable to have a clear definition of the performance to be acquired, and for the time necessary to master them to vary for different students, depending on their ability, and drive, the availability of teachers and educational facilities.

3.3 There is no natural frontier in medical practice between the physical sciences and the humanities, nor between science and culture in the broadest sense of the word. The giving of courses in the humanities and the behavioural sciences does not automatically ensure that future physicians will be able to relate their daily practice to the culture to which they belong. On the other hand, they will do so if they are required to define the patients' social and psychological problems in addition to his medical ones, and to look for a logical solution, either by themselves or with the aid of specialists.

3.4 The educational role of the basic scientist is not to train the future physician in his academic specialty but to ensure that the student is able to detect any violation of basic scientific principles in his practice.

## Features of the new programme : COMPETENCY based CONTRACT.

The programme includes 4 phases at the end of which the student is awarded a degree certifying he has a satisfactory level for specified competencies.

The total duration of each phase may vary for each student and is determined by the achievement of an acceptable level of performance for a given number of educational objectives which constitute, as a whole, the basis of a contract between the student and the teaching institution. Depending on the terms of the contract, the degree may be that of doctor of medicine, medical assistant or specialist in cardiology for example.

## General educational objectives of the new programme

### First phase (very approximate length - 1 to 3 months)

1. At the end of the first phase, the student should be able to:

1.1 Show competence in planning education.

1.1.1 Define educational objectives in terms of behaviour.

1.1.2 Plan a learning programme.

1.1.3 Construct tests and other measuring systems.

1.2 Utilize the resources of the institution, namely: microscopes, slides, library, computers, members of the health team.

1.3 Describe the concept of health team.

### Second phase (approximate length - 12 to 18 months)

2. At the end of the second phase, the student should be able to:

2.1 Prepare a list of what he considers the ten main health problems of the community.

2.2 Collect data "base" relevant to the community and interpret these data in order to . . .

2.3 . . . identify its priority health problems.

2.4 Describe health activities which would enable these community health problems to be resolved and compare these activities with those usually undertaken.

2.5 Identify the professional role which he (the student) wishes to assume at the end of his basic training.

2.6 Describe the tasks corresponding to that role.

2.7 Prepare educational objectives (with evaluation criteria) whereby acceptable competence can be achieved for each of these tasks.

→ It is THEN that the CONTRACT is signed between the student and the university.

Third phase[1] (very approximate length - 1 year)

3. At the end of the third phase, the student should be able to:

3.1 Collect the "data base" on the members of the community, both sick and healthy (the meaning of data base: chief complaint, patient profile, systems review, physical examination, laboratory data, etc. is clearly defined by Weed; the reader is advised to consult his works and make sure that students collect all the necessary data).

3.2 Audit the data base for a given patient collected by another student.

3.3 Carry out clinical techniques (such as phlebotomy, sutures, lumbar puncture, funduscopy, auscultation, etc.) corresponding to the educational objectives described under 2.7.

Fourth phase (very approximate length - 3 years)

4. At the end of the fourth phase, the student should be able to:

Carry out (together with other members of the health team) all tasks involved in the health promotion/rehabilitation of the community in which he is living.

Note - It is obvious that there exists, and will continue to exist a relationship between the socio-political system of the community and its types of health and educational services.

Moreover, since student selection criteria also reflect the socio-political system, it should be borne in mind that they can influence the results of the training programme.

Finally, it would appear that this approach can be utilized in any kind of country, whether poor or rich. While the concept of data collection, and evaluation systems, suggest that computers could be usefully employed, they are not essential. Recourse to data processing and the associated equipment is often useful and sometimes indispensable when a large number of data have to be managed, but it is not a neutral instrument and in the developing countries care should be taken that data processing does not represent an instrument of economic and technological, and consequently, political, dependence.

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[1] The third and fourth phases correspond to the programme in the form proposed by L. Weed in The New Curriculum, the problem-orientated system, Medcom 1972, pp. 95-104.

## The new role of the teacher[1]

(1.1) 1. To be available to provide students with a constructive critical analysis of their working objectives and methods.

(1.2) 2. To be competent to analyse and evaluate health problems identified by students, as well as proposed solutions.

(3.2) 3. To define the competencies which students should be encouraged to acquire in order to solve a given health problem.

(1.3) 4. To construct criteria in order to facilitate the assessment of students' work and to measure their competencies.

(2.4) 5. To select professional activities of graded difficulty appropriate to the students' level during the whole of their learning curriculum.

(2.3) 6. To prepare working documents and provide information which would facilitate students' independent work and to evaluate the efficiency of such documents.

(2.6) 7. To confront students with a diversity of new problems in order to help them to define their parameters and find solutions to them.

(2.1) 8. To facilitate students' learning by putting questions requiring problem-solving skills rather than recall.

(2.5) 9. To verify that the students find the basic principles underlying the professional activities which they are required to accomplish during their cycle of studies.

(2.2) 10. To ensure intellectual discipline by careful observation of students' work and to make a value judgement on their activities.

(3.1) 11. To be uncompromising in relation to students' performance level for a given task.

(3.4) 12. To verify each step the student takes in solving health problems, in order to identify the possible violation of basic scientific principles.

(3.3) 13. To verify that the student identifies and takes account of bio-psychological, cultural and socio-economic factors underlying the health problems which he is required to solve during his course of study.

(1.4) 14. To serve as a role model and give an example of reliability, sense of analysis, efficiency and professional ethics.

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[1] The numbers in brackets correspond to those of "Weed's premises", pp. 246-247.

**Exercise**

Carefully read (or re-read) Weed's 14 premises (pp. 246 and 247) and circle the numbers of all those with which you agree.

If you agree with at least ten of them,[*] read "the new role of the teacher" and circle the numbers of all the roles you think you can already assume, taking into consideration present academic regulations, your personal situation and other local constraints. In each case describe in CONCRETE terms what activity you would perform during the next 12 months.

| DESCRIPTION OF CONCRETE ACTIVITIES CORRESPONDING TO NEW ROLE |
|---|
| |

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[*] If you do not, try to discuss the matter with another colleague and see if it helps you to modify your opinion.

**Exercise**

If you are of the opinion that all of Weed's premises are desirable, try to go further and describe all the obstacles you would be liable to encounter if you were to try to introduce the competency based programme (pp. 247 and 248) or some adaptation which you might prefer, indicating the tactics for overcoming each obstacle.

| OBSTACLES | TACTICS |
|---|---|
| | |

# QUALITIES OF A CURRICULUM COMMITTEE COORDINATOR

He need not necessarily always have all the following qualities, but if you had to choose at some time or another between two colleagues it is suggested that you choose the one most resembling this description.

He should be AVAILABLE

MOTIVATED

HAVE THE SUPPORT OF THE SCHOOL ADMINISTRATION

ACCEPTED BY THE STUDENTS

and also have as many as possible of the qualities listed below:

1. Very thorough knowledge and wide professional experience
2. Recognized skill in educational planning
3. The personality of a leader
4. A reputation as a research worker
5. Years of experience as a faculty member
6. A reputation as an author

## CURRICULUM SPECIFICATION TABLES

These "tables"[1] are, so to speak, check lists enabling you to make sure that the curriculum will really be prepared taking educational objectives into account, for it may happen that the best-intentioned teachers can, on the one hand, make an effort to define educational objectives, and, on the other, then prepare curriculum which, on analysis, seem to neglect them completely. So as to "force" you to bear these objectives in mind the following specification tables have been prepared; they will help you to relate each part of the curriculum directly to a given objective.

In other words "every part of the curriculum should correspond to an objective" and "every objective should have a corresponding element in the curriculum".

SPECIFICATION TABLES ARE AN INSURANCE AGAINST NON-RELEVANT PROGRAMMES

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[1] The same principle can be employed to "check" an examination system (see page 454).

## EXAMPLE OF CURRICULUM SPECIFICATION TABLES
## - Public Health Administration -

| ADMINISTRATION (Institutional obj. 2) | Theory | Problem Solving (case study) | Total |
|---|---|---|---|
| General administration (Intermediate obj. 2.1) | 10[*] | 20 | 30% |
| Planning (Intermediate obj. 2.2) | 5 | 15 | 20% |
| Research (Intermediate obj. 2.3) | 5 | 20 | 25% |
| Statistics (Intermediate obj. 2.4) | 5 | 20 | 25% |
| Total | 25 | 75 | 100% |

| GENERAL ADMINISTRATION (Intermediate obj. 2.1)[**] | Cognitive domain | Affective domain | Psychomotor domain | Total |
|---|---|---|---|---|
| Analysis of administrative situations (Specific obj. 2.1.1) | 10 | 15 | 5 | 30% |
| Human needs versus bureaucracy (Specific obj. 2.1.2) | 5 | 10 | 5 | 20% |
| Administrative decision making (Specific obj. 2.1.3) | 10 | 5 | 5 | 20% |
| Group dynamics, Team work (Specific obj. 2.1.4) | 5 | 15 | 10 | 30% |
| Total | 30 | 45 | 25 | 100% |

---

[*] The absolute numbers indicate hours.

[**] The numbers of hours has been multiplied by 10 in order to facilitate understanding of the table.

And now . . . use a specification table for your own teaching programme (or part of):

| | | |
|---|---|---|
| | | |
| | | TOTAL |
| | | |
| TOTAL | | 100 % |

IT WAS FELT USEFUL AT THIS MID-POINT OF THE EDUCATIONAL HANDBOOK TO ATTEMPT TO SUMMARIZE THE MAJOR CONCEPTS PRESENTED SO FAR AND PLACE IN PERSPECTIVE THE TWO FOLLOWING CHAPTERS. WE FELT THE FOLLOWING ARTICLE WOULD VERY WELL SERVE THIS PURPOSE.

YOU WILL FIND LATER THE NAME OF THE AUTHOR AND, WHAT IS MORE SIGNIFICANT, WHEN IT WAS WRITTEN.

## Distinctive attributes of education for the professions

Educational ferment characterizes schools and colleges throughout the world. New responsibilities, new definitions of educational aims, new programmes are emerging at all levels of the educational ladder. At first glance, these new developments appear to have no common elements but to be highly individual, unrelated incidents of educational change.

It is helpful to consider first the essential characteristics of a profession and, second, the major tasks involved in planning and conducting an educational programme. In the light of these two factors, the significant elements of effective education for the professions can be seen more clearly.

### A profession based on a code of ethics

From the standpoint of the education required, there are two essential characteristics of a true profession. The first is the existence of a recognized code of ethics. This ethical code commits the members of the profession to certain social values above the selfish ones of income, power, and prestige. In the case of medicine, for example, its code of ethics dedicates the doctor to the saving of lives and the protection of the patient's health above all material and personal considerations.

A professional code of ethics not only professes social values that are above selfish ones, but it expects the individual member seriously to dedicate himself to these higher values. Furthermore, a profession establishes some form of group discipline in support of these values. A doctor who violates the ethical code of medicine receives the disapproval of fellow doctors and is subject to discipline by the state for malpractice. One of the indications that an occupation is becoming a profession is a concerted movement among members of the occupation to establish and maintain group discipline in order to uphold the ethical values to which the group gives lip service.

A common problem in several professions is to distinguish ethical values that are broadly social from a pseudo-ethical code that in reality dedicates the individual to the selfish interests of the group rather than to mankind generally. In some programmes for the education of doctors, there has been a tendency to develop a code of ethics in which the doctor dedicates himself to the medical profession and to the interests of doctors rather than to the improvement of the health of mankind.

A profession is not a union. Professional ethics must focus upon higher social values than dedication to the selfish interests of the professional group. Yet to attain this high aim is one of the serious problems of the professions.

### A profession based on principles

The second distinguishing feature of a profession is the basing of its techniques of operation upon principles rather than rule-of-thumb procedures or simple routine skills. For an occupation to be a profession it should involve complex tasks which are performed by artistic application of major principles and concepts rather than by routine operations or skills. This is an important differentiating feature. A skilled trade, obviously, involves some fairly complex tasks, but the members of the trade are able to perform these tasks through acquiring certain routine skills and through following certain specified rules. Many of the problems encountered by a member of a profession are in a certain sense unique. To solve such a problem he must draw upon certain basic principles. However, the application of these principles necessitates an analysis of the particular problem to see what are its unique aspects which will require adaptation of the principles. This adaptation is an artistic task; that is, it involves individual judgement and imagination as well as skill. A skilled trade does not demand this type of intellectual operation.

In the early days, surgery was not really a profession but was a skilled trade. Certain skills, such as those used in bone-setting, were transmitted from one generation of surgeons to another, and the surgeon learned largely as an apprentice how to carry on his trade. With the development of the basic medical sciences like anatomy and physiology, it became possible to gain a more fundamental understanding of what was involved in bone structure and in tissue development, so that a surgeon with adequate scientific background was able to adapt his particular procedures to the specific conditions surrounding a given case. He then solved the problem in each case in terms of basic principles rather than simply following rule-of-thumb procedures.

Whenever a member of any profession meets his day-by-day tasks in terms of routine performance, for him the occupation is no longer a profession.

A profession not only utilizes basic principles rather than depending on rule-of-thumb procedures, but as it becomes more mature it recognizes that the principles used in the profession must be viewed in an increasingly larger context and that, correspondingly, the science needed by the profession must be continually extended to more basic content rather than restricted only to the obvious applied science. Thus, increasingly has medicine come to recognize the interrelationship of nutrition, physiology, anatomy, biochemistry, and other fundamental sciences which give a much broader basis for understanding a particular medical condition of a given patient.

In general it can be said that as a profession becomes increasingly mature, it not only develops members who carry on their work through principles rather than rule-of-thumb procedures, but it also encourages members to gain an understanding of these principles in a much larger context than that afforded by the usual confines of the occupation.

I have emphasized these two major characteristics of a profession - the development of a code of ethics, and the use of techniques that are based on principles - both because they are the most significant differentia of professions from other occupations and also because they help to indicate some of the fundamental tasks of professional education.

## Tasks in planning and conducting an educational programme

Shifting our attention from the essential characteristics of a profession to the tasks involved in planning and conducting an educational programme, we find it possible to classify these tasks into four major types, namely: (a) deciding on the objectives; (b) selecting learning experiences that will contribute to the objectives; (c) organizing the learning experiences to maximize their cumulative effect; and (d) evaluating the effectiveness of the educational programme in attaining its objectives through appraising the educational progress of the students.

Education is a process for changing the behaviour of students in desired directions. The term "behaviour" is used in the broad sense and includes thinking, feeling, and acting. When a student is educated he has acquired ideas, habits, attitudes, interests, ways of thinking, and professional skills which he did not have before he went to school; his behaviour has changed.

From this definition of education it is clear that the educational objectives are the behaviour patterns that the school tries to develop in the student. The knowledge, the skills, and the ways of thinking that the student is expected to acquire are examples of these objectives. The task of deciding on objectives is an important one because these are the aims and purposes which can and should be used to guide the entire educational programme. The only rational basis for selecting learning experiences and devising evaluation procedures is in terms of their relation to the educational objectives.

The second major task of education is to select learning experiences that will contribute to the objectives. This raises a previous question: how do people acquire these desired changes in behaviour patterns? "People acquire them by practicing them" is a simple but fairly accurate answer. Getting students to practice the desired behaviour, however, is not the easiest thing in the world.

A student develops understanding by recalling ideas, by explaining them in his own words, and by finding illustrations of them. Skill in ways of thinking are developed by practicing problem-solving again and again. Manual skills and habits are also acquired by practice. An attitude is acquired as the student looks repeatedly at the phenomenon from a new perspective. Interests are acquired by getting satisfaction from certain kinds of experiences so that the experiences become increasingly satisfying. For all of these kinds of behaviour, students acquire new behaviour patterns by practicing them.

One fact clearly emerges from this analysis - the teacher cannot learn for the student. Whether or not the student develops an understanding will depend upon what is going on in his mind, not what is going on in the teacher's mind. To plan learning experiences is to outline the activities that will give the students a chance to practice the behaviour implied by the objectives. Thus, planning a particular course will mean providing situations in which students will encounter problems to solve so that they can gain understanding and develop critical thinking. Planning may also involve providing tasks which require the students to practice manual and intellectual skills and habits, and so on.

The third major task in education is to organize the learning experiences to maximize their cumulative effect. We can increase the cumulative effect of learning experiences in two ways: through sequential organization and through integration. When learning experiences are arranged so that the students begin with simpler concepts and skills and go on to broader and deeper applications, far greater learning results than with a random arrangement of learning. This is sequential organization. Integration involves relating what is taught in one part of the educational programme to what is taught in another part. Effective organization of learning experiences involves planning both for sequence and for integration.

The fourth major task in education is to evaluate the effectiveness of the educational programme in attaining its objectives, through appraising the educational progress of the students. This requires evidence of changes in students' behaviour during the time they are taking part in the educational programme. It means appraisal early in the course as well as near the end. It involves evidence relating to all of the important objectives which will help us to identify those aspects of the curriculum that are effective and those that need improving.

With this brief review of the essential characteristics of a profession and the major tasks in planning and conducting an educational programme, we can identify more easily the distinctive attributes of education for the professions.

## Objectives of professional education

The existence of principles and of a code of ethics in a profession points to several kinds of educational objectives which are important in educating for a profession. The development of an ethical practitioner who has an adequate understanding of the ethical code of the profession, who applies the ethical principles intelligently to the varied particular instances that arise, and who is sincerely committed to the highest ends of the profession, requires an education programme which consciously aims at several major types of objectives.

In terms of knowledge and understanding, a programme of professional education needs to develop in students a broad and clear concept of the social role of his profession. This includes understanding of the social functions the profession serves and how these functions are related to the total functioning of society and to the functions of other major specialized groups. It also includes an understanding of the various kinds of relations which exist between the profession and society at large and between the profession and other specialized groups, including the expectations which these groups hold regarding the members of his profession.

Also, in terms of knowledge and understanding, professional education aims at developing a deep *understanding of the persons for whom the professional service is rendered* including particularly insight into personal motivations, feelings, needs, and the interrelation of physical, psychological, social, and emotional aspects of human behaviour. Furthermore, professional education needs to include among its objectives the development of *self-understanding* in the students. Obviously, in no sense can complete self-understanding be attained by the time of graduation from the professional school, but a sufficient beginning can have been achieved *to provide for continued development* as he pursues his professional career.

In terms of effective thinking or problem-solving, the objectives of professional education which are derived from the importance of ethics include the *ability to recognize ethical problems, the ability to identify the ethical principles at issue*, and *the ability to work out appropriate courses of action in terms of ethical principles*.

In terms of attitudes, education for the professions aims at developing loyalty to the social well-being of the persons who are served by the profession, concern for a truly social role on the part of the profession, a sense of self-respect for the social contributions of his profession and of his own work, and a warm, accepting, yet objective attitude towards his clients. This involves *developing in professional students a considerable degree of emotional maturity so that they are free to express and receive emotionally charged communication and at the same time can act intelligently as new problems arise*.

The foregoing objectives clearly represent a large task for professional education, but these are not all the important objectives. The requirement that the professional practitioner operate on the basis of principles rather than rules implies certain additional objectives if the educational programme is to aim consciously to develop students who can operate in this fashion. Some of the purposes outlined above contribute to the *performance of professional duties in terms of principles*. In addition, in terms of knowledge and understanding there is need to *understand the structure and functioning of the institution in which the profession operates*, whether this be school, church, hospital, court, or other institution. Only with such a broad view can a professional practitioner operate with intelligence and on the basis of principles adequate to produce desired consequences.

Finally, of course, every professional school needs to aim consciously *to develop an understanding of those principles, concepts, facts, and procedures which are basic to professional operations*. In medicine these include principles of physiology, anatomy, chemistry, physics, bacteriology, and psychology. The tendency, however, is to limit these basic principles too narrowly. In a very real sense, doctors deal with problems in their normal professional work which are psychological and require an understanding of relevant psychological principles if they are to operate intelligently.

In terms of effective thinking, of problem-solving, it is clear that the foregoing objectives involving knowledge imply *the development of some skill in recognizing professional problems, in analyzing the problems in terms of the relevant principles, and in working out courses of action by applying these principles*.

In terms of attitudes, the use of principles, rather than rules in a profession, requires as objectives in professional education the development of broad, rather than narrow, interests in the fields on which the profession draws, and the *development of the student's interest in continuing his own learning long after graduation from a professional school*.

### Planning learning experiences

The previous section outlines characteristic objectives of professional education. What about the learning experiences which the professional may use to attain these objectives?

The *most common problems* in professional schools in connexion with the learning experiences used are: (1) *the failure to select learning experiences in terms of the objectives to be attained*; (2) *the failure to utilize consciously appropriate learning procedures for developing problem-solving skills, attitudes, and interests*; and (3) *the failure to develop effective motivation for learning*. These are serious deficiencies.

Since learning is an active process, in which the learner himself is definitively involved, motivation is essential. Since the learner learns more than knowledge of content, and he actually learns what he is doing, what he is feeling, what he is thinking, it is important to make conscious plans for students to learn to solve problems, to develop attitudes and interests. Since objectives represent the aims of the professional school and learning experiences are the means of reaching educational aims, the latter should be planned in terms of these aims.

An essential factor in planning learning experiences in terms of the objectives sought is to have clearly in mind what the objectives imply, both as regards behaviour to be developed and content involved. For example, if the objective "understanding the social functions the profession serves and how these functions are related to the total functioning of society and to the functions of other major specialized groups" is to serve as a guide for planning, learning, we must have a clear idea of what is meant by "understanding" as a type of behaviour to be developed and what content is included in the phrase beginning "the social functions the profession serves". Most instructors who have sought to define "understanding" indicate that it is a mental process that is more active than memorization, since it involves not only remembering but also the ability to explain the concept or principle in one's own words, the ability to interpret, to illustrate, and to compare and contrast it to related ideas. Such a definition clarifies the behaviour that the student is expected to develop and, as pointed out earlier, it suggests the kind of learning experiences that are required to attain the objective. These would be learning experiences which give the student opportunity to explain, to interpret, to illustrate, and to compare and contrast it to related ideas. By defining the content implied by the phrase beginning "the social functions the profession serves", we are able to identify what the principles and concepts are which the students will be given opportunity to explain, to interpret, to illustrate and to compare and contrast with related ideas.

Correspondingly, as we define each objective in terms of the behaviour and content implied, it is a much easier step to select learning experiences that give students a chance to practice the behaviour involved and to utilize the relevant content. In this way, learning experiences are planned in terms of the objectives sought.

The fairly common practice in professional schools of giving almost exclusive attention to knowledge and to technical skills may be partly due to the failure to recognize that effective thinking, attitudes and interests are also learned and can be consciously developed in programmes of professional education. Skills in ways of thinking are acquired by practice in solving problems. A new attitude is acquired by repeatedly observing and reacting to certain phenomena from a new perspective. Interests in certain kinds of activities are developed as the student gains satisfaction from participating in these activities. For each of these types of objectives, definite learning experiences can be provided so that students are practicing problem-solving, they are injected into situations from a new perspective, they they are able to gain satisfaction from certain kinds of activities. In short, professional schools can plan learning experiences for developing effective thinking, attitudes and interests.

This leads to consideration of the primary significance of motivation. Since the learner learns through his reactions, unless he can be involved in the situation, unless he can be guided to think, feel, and act in ways appropriate to the situation, it is not possible for him to learn. Practice alone, even when carried to unusual limits, does not take the place of the learner's being involved in what he is doing.

### Organizing learning experiences

There are not only problems involved in the selection of learning experiences but also in their organization. As the programmes of professional education have become more complex and involved larger staffs, they have become more disintegrated. Yet significant changes in behaviour, that is, fundamental learnings, require a long time to develop. It is necessary that what is learned this term builds upon what was learned last term, that what will be learned next year builds upon what is learned this year. This is sequence learning.

However, effective sequence is not simply a series of repetitions from one year to another. Rather, it includes variety in the learning experiences, so that each subsequent term emphasizes the main things to be learned, but in varied contexts. In this way, ever broader and deeper learnings are achieved.

Furthermore, effective organization provides for relations from one course to another and from one field to another which reinforce the learning in each course or field. This is done both by helping the student to use things learned in one course or field in another, and by helping him to perceive differences as well as similarities in the concepts, principles, attitudes and skills utilized in the various courses and fields. This is called curriculum integration.

Sequence and integration are essential to programmes of professional education, but because of the tendency towards specialization and separation, conscious efforts are required to plan for and develop effective organization.

One significant development in working out a better organized curriculum is the building of a closer and more appropriate connexion between theory and practice, between the art and the science of the profession. Many institutions are not only teaching general principles but are also helping students to apply these principles to particular cases so that it is possible for them in practice to use the principles as they deal with particulars. Effective professional education requires this close connexion between theory and practice. Without theory, practice becomes chaotic, merely a collection of isolated, individual cases. Theory gives meaning and unity to what would otherwise be specific and isolated cases.

On the other hand, without practice theory becomes mere speculation. The realities of practice provide a check upon pure speculation, a test of the adequacy of theory; and also, practice provides the problems which must be dealt with by any comprehensive theory. Hence these efforts to connect theory and practice more closely are important contributions to professional education.

Another illustration of this development is the increasing use of the case method. The case method involves the student in the study of a concrete and particular case. However, for him to understand this case and deal with it effectively, he must bring to bear the theory, the concepts, the principles, that are basic to the issues raised by the case. The internship provides concrete experiences which are interpreted in terms of basic theory in the accompanying seminars. This shuttling back and forth between general and specific aspects of a profession helps to build an increasingly adequate context of concepts and principles by which a member of the profession can understand the operations to be performed in relation to the values to be attained. An adequate theory helps him to relate particular activities in an individual case to the larger social issues, to see the connexion between the activities of the daily operations of the profession and the welfare of society generally.

However, for these types of educational programmes to be effective, more than superficial experience and explanation must be provided. The student needs many opportunities to deal with situations in the basis of a careful analysis of them, to identify the values and principles involved, and through practice to develop artistry in devising means to deal with the situation in order to preserve these values. This is the aim of efforts to knit theory and practice more closely together.

Another effort at extending the sequential organization of professional education is the working out of definite plans for continuing education after the member of the profession has completed pre-service training and has been inducted into the initial activities of his work. Fifty years ago medical schools felt that their work had been done when their graduates had been admitted to initial professional activity. As the years went by it became increasingly clear that many members of the profession did not grow after they began their work and that in some cases the older practitioner was much less competent than those currently beginning their profession. Few doctors made any effort to continue their education after graduation.

Now there is a marked tendency for professional schools to develop programmes of continuing education, in some cases bringing the work of the school to the practitioner in the field, in other cases setting up short courses, institutes, or long-term seminars for practitioners to take on the campus.

## Evaluating effectiveness of educational programmes

The final attributes of professional education are those involved in the task of evaluating the effectiveness of the educational programme in attaining its objectives, through appraising the educational progress of the students. Four important attributes are too often neglected in current educational programmes.

The first of these is conducting an appraisal in terms of all of the important educational objectives of the professional school. The common practice is to appraise the knowledge of the students and certain of their technical skills. In addition, many professional schools appraise the student's ability to solve problems as these are presented in verbal form. Few institutions provide for careful, systematic appraisal of problem-solving in the professional situation, and appraisal of professional interests and attitudes. Hence the school does not have a comprehensive picture of the achievements of its students in terms of its own purposes.

A second attribute, often neglected, may partly account for the shortcomings in the first. A comprehensive programme of evaluation uses varied devices for obtaining evidence regarding the educational progress of students. These devices include not only written tests and examinations, useful as they are, but also observations, interviews, questionnaires, reports from the field, samples of the student's work; in short, any device which gives valid evidence regarding the significant behaviour of the student. Few professional schools consistently evaluate their effectiveness in such varied ways. They tend to limit their appraisal to written examinations and to rating forms. This does not provide adequate means for comprehensive evaluation.

Appraisal of the progress of students toward the objectives of professional education requires evaluation at several points in his career. This is a third essential attribute. To get evidence of progress requires at least three appraisals, one early in his attendance at the professional school, one near his graduation, and one after several years of service in the profession. Some schools attempt annual appraisals during the student's enrolment. The changes made while in the school throw light on the immediate effectiveness of the school's educational programme, while the appraisal after the student has spent several years in the profession provides evidence of the permanence of learning and the extent to which it has achieved some continuity with professional experience. Unfortunately these studies of progress are quite rare. This may be partly due to the lack of appreciation of the way in which systematic sampling of students and alumni small enough to permit the use of individual interviews, yet at the same time sufficiently representative to permit valid generalizations regarding the populations from which the samples were drawn.

The last attribute to be mentioned here is the use of evaluation in improving the educational programme as well as in providing information to guide work with individual students. Too often, what little appraisal of student achievement is conducted results only in grades for the students. Actually an evaluation programme can serve as a helpful means for continued improvement and development of the professional school. The results of appraisal indicate the respects in which students are making substantial progress and the respects in which expected development is not taking place. These suggest aspects of the educational programme which need re-thinking and re-planning to provide for improvement. Furthermore, as revisions are made in the programme, subsequent evaluation indicates the relative effectiveness of these revisions. Hence, appraisal provides a sound basis for planning.

The evaluation data also indicate the progress made by individual students and bring to attention both their strength and their difficulties. This information thus provides a sound basis for the guidance of individuals and gives a more substantial foundation for the individual student's continued planning of his own education.

In summary, the distinctive characteristics of a profession, namely its ethical code and its operating basis on principles, suggest the distinctive attributes of education for the profession. From these characteristics, important educational objectives can be derived. Because these objectives are complex and involve understanding, problem-solving, attitudes and skills, they require clear definition in order to develop effective methods for their attainment. The difficulty of attaining the goals of professional education makes motivation of prime importance and effective organization of learning experience a necessity. Finally, a comprehensive evaluation programme is required to guide the continued development and improvement of the educational programme and to provide information for constructive work with individual students. The building of an effective programme of education for a profession is not easy but when attacked intelligently, systematically, and enthiusiastically, it can be done.

☞

THE AUTHOR OF THE PRECEDING PAGES* IS

RALPH W. TYLER

HE OBTAINED HIS DOCTOR'S DEGREE FROM THE

UNIVERSITY OF CHICAGO IN 1927 ........

HALF A CENTURY AGO!

HE WROTE THESE LINES IN 1951 .......

A QUARTER OF A CENTURY AGO!

IN SPITE OF THIS THEY REMAIN A REALITY OF TODAY.

*

FOR THOSE INVOLVED IN CURRICULUM PLANNING THIS CLEARLY MEANS

THAT PATIENCE AND PERSEVERANCE IS THE ORDER OF THE DAY.

*

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* The paper was presented on January 30,1952, in New York at the Annual Meeting of the American Association of Schools of Social Work and printed in the Social Work Journal, April 1952.

## EXERCISE

(Check your answers on page 273)

Instructions = for each question select ONE answer.

**Question 1.** Teachers frequently complain of the lack of motivation of students in explaining an unexpected number of failures. Which of the following concepts is reflected by this attitude:

The primary role of the teacher is:

A. To facilitate learning by the students.

B. To transmit knowledge to the students.

C. To guide the cognitive development of the students.

D. To encourage increase of responsibility of the students for their own learning.

E. To promote the motivation of the students.

**Questions 2 to 7.** (true or false type)

According to present educational trends

2. The systematic approach helps to formulate hypotheses regarding the process of acquisition of competencies and facilitates the choice of relevant learning situations (true-false).

3. The primary role of the teacher is to transmit knowledge within the field of his specialty (true-false).

4. The teacher helps the student to learn and the converse is also true (true-false).

5. Modern educational trends lay more stress on the teacher than on the student (true-false).

6. The student's judgement of the value of an educational activity is perhaps more relevant than that of the examiners (true-false).

7. Modern educational trends transfer part of the role of the teacher to the student (true-false).

**Question 8.** Indicate which of the following factors seems to be least likely to bring about a transfer of knowledge:

A. Teaching is modelled on the organization of each discipline.

B. The teaching environment resembles the professional practice environment.

C. Teaching calls for active student participation.

D. Teaching is centred on the health needs of the population.

E. Teaching aims at developing complex cognitive abilities.

**Question 9.** The many definitions of learning all include the following characteristics, EXCEPT ONE. State which:

A. A more or less permanent change occurs in the student's behaviour.

B. It is not directly observable.

C. Repetition by the student is a favourable factor.

D. The role of the teacher is primordial.

E. Motivation is an essential element.

**Question 10.** Research has shown all the following factors, except one, to be effective in maintaining motivation in the student:

A. Presence of gratifications suitable for ensuring a continuity of learning.

B. Presence of a punishment system suitable for controlling deviant behaviour.

C. Detailed description of the objectives pursued and communication of these objectives to the students.

D. Presence of an evaluation system frequently measuring the motivation level of the students.

E. Presence of educational activities suitable for stimulating active learning.

**Question 11.** When preparing part of the curriculum whose aim is to make students capable of showing creativity in looking for solutions to medical problems, the most suitable learning activities for that objective are:

A. The students participate in courses and demonstrations by teachers with a very creative attitude who are themselves excellent research workers.

B. The students participate in laboratory and field exercises during which they reproduce basic and classic experiments.

C. The students participate in a planned series of hospital, field and laboratory activities, and must present the solutions to exercises in clear terms.

D. The students participate in hopsital, field and laboratory activities and must write a report describing the experiments in which they have participated.

**Question 12.** A curriculum specification table:

A. Is a table giving details of a curriculum (time-table, premises, etc.)

B. Is a control sheet for checking whether the elements of the curriculum are related to the educational objectives.

C. Is a control sheet for checking the specificity of the educational objectives.

D. Is a list of contents giving detailed instructions concerning programmed learning.

Question 13. Which of the following criteria (for selection of educational material) does not agree with any of those defined by Penta & Telder:

The material should:

A. be appropriate to educational objectives;

B. promote active student involvement;

C. be appropriate to the students;

D. be of good technical quality;

E. be very cheap.

Questions 14 to 17.

Indicate for each of the following questions whether reference is made to:

A. an epidiascope

B. a diascope

C. a slide projector

Question 14. Can project outlined figures (or letters) on a transparent support (25 x 25 cm) so that they can be read in a lighted room.

Question 15. Can project outlined figures (or letters) on opaque paper so that they can be read in a darkened room.

Question 16. Is also called an "overhead projector".

Question 17. Can project outlined figures (or letters) on a transparent support (50 x 50 mm; 24 x 36 mm) so that they can be read in a darkened room.

Questions 18 to 20. (true or false type)

According to L. Weed:

18. Length of training should be fixed in advance for a given group of students depending on the type of degree (true-false).

19. The student should be able to define his own work objectives within an organized system of medical care (true-false).

20. Teaching of basic principles should precede the introduction of students to practical problems (true-false).

Answers suggested for the exercise on pages 267 to 269

| QUESTION | SUGGESTED ANSWER | If you did not find the correct answer, consult the following pages again |
|---|---|---|
| 1 | B | 205-206 |
| 2 | True | 205-206 |
| 3 | False | |
| 4 | True | |
| 5 | False | |
| 6 | True | |
| 7 | True | |
| 8 | A | 114, 208, 210, 214 |
| 9 | D | 213 |
| 10 | D | 210, 214 to 216 |
| 11 | C | 208 to 210, 229, 245 to 249 |
| 12 | B | 255 to 257 |
| 13 | E | Public Health Papers No. 52, WHO, pp. 40 to 50 |
| 14 | B | 223 to 226<br>Public Health Papers No. 47, WHO, pp. 53 to 78 |
| 15 | A | |
| 16 | B | |
| 17 | C | |
| 18 | False | 245 to 248 |
| 19 | True | |
| 20 | False | |

*

CONGRATULATIONS! YOU HAVE WORKED OUT A CURRICULUM CORRESPONDING TO YOUR SUBJECT.

BUT BE CAREFUL ...

- MAKE SURE ONCE MORE THAT IT AGREES WITH THE INSTITUTIONAL OBJECTIVES.
- PAY CAREFUL ATTENTION TO RELEVANCE.
- EFFECTIVE TEACHING CAN BE MORE DANGEROUS THAN NO TEACHING AT ALL IF IT IS NOT REALLY RELEVANT.

★

# 3

# EVALUATION

This third chapter presents basic concepts in the domain of educational evaluation. It stresses the very close relationship between evaluation and definition of educational objectives; and the primary role of any evaluation, which is to facilitate decision-making by those responsible for an educational system. It defines the subject, the purpose, the goals and the stages of evaluation. It shows that a classification of intellectual processes can be of considerable help in constructing an evaluation system.

Those who would like to learn more concerning these problems should consult the following publications:

- Public Health Papers No. 52, WHO, "Development of educational programmes for the health professions", 1974
- Evaluation of school performance. Educational documentation and information. Bulletin of the International Bureau of Education No. 184, third quarter 1972, 84 pages.

* * *

After having studied this chapter and the reference documents you should be able to:

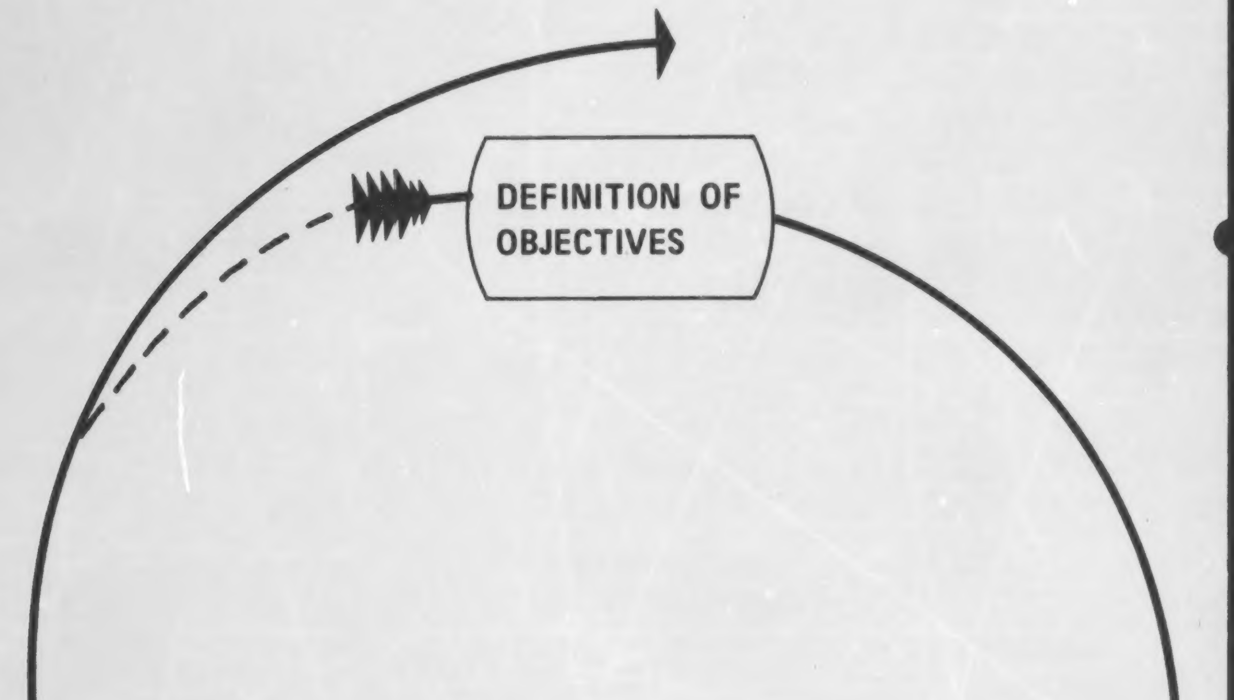
1. illustrate the relationship between evaluation and the other elements of the educational process;
2. define the major role of evaluation;
3. determine the purpose of evaluation;
4. mention six decisions which you feel you can take thanks to evaluation;
5. describe four steps in the evaluation process;
6. define the difference between formative and summative evaluation;
7. describe the general methodology of evaluation;
8. select the evaluation method most adapted to a given objective;
9. define the following terms: validity, reliability, objectivity, and indicate what relationship exists between them;
10. draw up an organizational diagram representing an evaluation system for your establishment;
11. identify obstacles and relevant strategies to improve an existing evaluation system.

EVALUATION IS . . . . . . . . ↴

➡ A DECISION ENABLING PROCESS

FOR BETTER EDUCATIONAL DECISION MAKING

## PLACE OF EVALUATION IN THE EDUCATIONAL CYCLE


DEFINITION OF OBJECTIVES
PROGRAMME IMPLEMENTATION
EVALUATION

## NOTICE

EVALUATION OF MEDICAL EDUCATION MUST BEGIN WITH A CLEAR AND MEANINGFUL DEFINITION OF ITS OBJECTIVES

### Exercise

Before starting to define the organization, stages or methods of an evaluation system suitable for the establishment in which you are teaching, it would be useful to state:

What important DECISIONS[1] you feel could be made on the basis of value judgements made possible by evaluation?

To decide . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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[1] Examples of "decision":

- ✱ to decide what students will be allowed to move up from the second to the third year
- ✱ or to decide to purchase an overhead projector rather than a blackboard
- ✱ or to decide to appoint Mr X Full professor.

# EVALUATION

## A FEW ASSUMPTIONS*

★ Education is a process, the chief goal of which is to bring about changes in human behaviour

★ The sort of behavioural changes that the school attempts to bring about constitute its objectives

★ Evaluation consists of finding out the extent to which each and every one of these objectives has been attained, the quality of teaching techniques and teachers.

➡

* adapted from DOWNIE

## Assumptions underlying basic educational measurement and evaluation[*]

Human behaviour is so complex that it cannot be described or summarized in a single score.

The manner in which an individual organizes his behaviour patterns is an important aspect to be appraised. Information gathered as a result of measurement or evaluation activities must be interpreted as a part of the whole. Interpretation of small bits of behaviour as they stand alone is of little real meaning.

The techniques of measurement and evaluation are not limited to the usual paper-and-pencil tests. Any bit of valid evidence that helps a professor or counsellor in better understanding a student and that leads to helping the student to understand himself better is to be considered worthwhile. Attempts should be made to obtain all such evidence by any means that seems to work.

The nature of the measurement and appraisal techniques used influences the type of learning that goes on in a classroom. If students are constantly evaluated on knowledge of subject-matter content, they will tend to study this alone. Professors will also concentrate their teaching efforts upon this. A wide range of evaluation activities covering various objectives of a course will lead to varied learning and teaching experiences within a course.

The development of any evaluation programme is the responsibility of the professors, the school administrators, and the students. Maximum value can be derived from the participation of all concerned.

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[*] Downie, N. M. Fundamentals of Measurement: Techniques and Practices. New York: Oxford University Press, 1967.

## EVALUATION IS

...... A CONTINUOUS PROCESS

...... BASED UPON CRITERIA

...... COOPERATIVELY DEVELOPED

...... CONCERNED WITH LEARNERS' BEHAVIOUR

## The philosophy of evaluation*

1. Each individual should receive that education that most fully allows him to develop his potential.
2. Each individual should be so placed that he contributes to society and receives personal satisfaction in so doing.
3. Fullest development of the individual requires recognition of his essential individuality along with some rational appraisal by himself and others.
4. The judgements required in assessing an individual's potential are complex in their composition, difficult to make, and filled with error.
5. Such error can be reduced but never eliminated. Hence any evaluation can never be considered final.
6. Composite assessment by a group of individuals is much less likely to be in error than assessment made by a single person.
7. The efforts of a conscientious group of individuals to develop more reliable and valid appraisal methods lead to the clarification of the criteria for judgement and reduce the error and resulting wrongs.
8. Every form of appraisal will have critics, which is a spur to change and improvement.

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* Downie, N. M. Fundamentals of Measurement: Techniques and Practices. New York: Oxford University Press, 1967.

## The psychology of evaluation[*]

1. For evaluation activities to be most effective, they should consist of the best possible techniques, used in accordance with what we know to be the best and most effective psychological principles.

2. For many years readiness has been recognized as a very important prerequisite for learning. A student is ready when he understands and accepts the values and objectives involved.

3. It has long been known that people tend to carry on those activities which have success associated with their results. This has been known as Thorndike's Law of Effect. Students in any classroom soon come to realize that certain types of behaviour are associated with success - in this case, high marks on a test or grades in a course. Thus, if a certain teacher uses tests that demand rote memory, the students will become memorizers. If a test, on the other hand, requires students to apply principles, interpret data, or solve problems, the students will study with the idea of becoming best fitted to do well on these types of test items. In the long run, the type of evaluation device used determines, to a great extent, the type of learning activity in which students will engage in the classroom.

4. Early experiments in human learning showed that individuals learn better when they are "constantly" appraised in a meaningful manner as to how well they are doing.

5. The motivation of students is one of the most important - and sometimes the most difficult to handle - of all problems related to evaluation. It is redundant for us to say that a person's performance on a test is directly related to his motivation. Research has shown that when a student is really motivated, performance is much closer to his real top performance than when motivation is lacking.

6. Learning is most efficient when there is activity on the part of the learner.

## "Continuous" evaluation

We know that evaluation of education should begin with a clear and meaningful definition of its objectives. We cannot measure something unless we have defined in advance what it is we wish to measure.

When this phase of evaluation comprising the definition of objectives has been properly completed, the choice or development of suitable examination procedures is that much simpler. Schematically represented, the education cycle (page 304) comprises the determination of objectives, the development of teaching activities and the development of evaluation procedures for possible revision of objectives. Evaluation should be "continuous" otherwise its function will merely be one of penalization. It should not simply be a course of obstacles which the students are supposed to get over and which becomes their sole subject of concern, the actual instruction becoming quite secondary. Under these circumstances, the student's only interest is how to obtain his diploma at least cost. The teacher is entirely at fault if the student is not convinced that the purpose of his education is not merely to obtain a diploma . . . and that the purpose of evaluation is to help him obtain it.

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[*] Downie, N. M. Fundamentals of Measurement: Techniques and Practices. New York: Oxford University Press, 1967.

## Teaching and performance level

The aim of teaching is to bring about an appropriate modification of behaviour, in the field of attitudes and practical skill, based on indispensable knowledge. The objective is thus: what we want the student to be able to DO on completion of the instruction, which he was unable to do initially, keeping in mind the "minimum level of performance", and laying stress on the observable and measurable aspects of the objective. The minimum level of performance is the minimum that the student must do to convince the teacher that he should be allowed to continue his studies or that he should be allowed to begin practising his profession without assistance or supervision.

Thus, in constructing an examination, it is essential to define the minimum level of performance (see also minimum pass level = MPL) that the student should achieve.

## ROLE OF TAXONOMIES IN EVALUATION (EXAMINATIONS)[1]

Classifications of educational objectives can, as we have seen, be used for curriculum planning and research. Taxonomies can also play an important role in designing achievement tests.

### 1. Building logic into achievement tests

Classification of achievement tests and test items is normally based on the content or form of the items. However the classification provided by the different authors is based on modifications in human behaviour which, from the educational standpoint, is more significant and avoids many ambiguities.

A sound evaluation system should be based on educational objectives. Logical classification of these objectives provides a logical scheme of classification of evaluation material based on objectives. What matters is not that it should be perfect but simply that it exists. It is not possible to measure without a unit of measurement.

### 2. Making evaluation more comprehensive

Generally speaking, in educational evaluation the cognitive domain is that which is investigated most frequently. Testing of knowledge is the dominant feature since it is an area which seems easy to investigate. Once the structure of educational objectives has been understood, it should be possible to make the evaluation devices more comprehensive and multi-dimensional, and to devise instruments for collecting evidence about objectives in different domains and at a higher level.

### 3. Providing criteria for the evaluation of achievement tests

In educational testing, it is first necessary to select appropriate techniques for collecting evidence about the student's achievement. For this purpose, the nature and level of the objective must be taken into account. The taxonomic classification can be used to evaluate the capacity of the technique to produce the desired evidence.

### 4. Developing a new typology of test items

The taxonomy is not in itself a typology of educational objectives; but it can be used for developing a useful typology of test items. At present, the typology of test items is based on the form of the item, such as multiple choice type, or the form of the answer, such as essay type, "objective" type, etc. With the addition of a new dimension of objectives it is possible to develop a more meaningful classification. For example, an item concerning a given topic may be of the knowledge-based multiple choice type, or of the application-based short answer type or of the analysis-based essay type and so forth. This two-dimensional classification of test material would make testing more meaningful and precise. It would also ensure better communication among evaluators, which is one of the functions of a good taxonomy.

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[1] Adapted from R. H. Dave, Op. Cit., p. 160.

### 5. Facilitating the construction of relevant test items

Test items are often constructed without conscious effort to base them on predetermined objectives. Emphasis on form and subject matter in constructing a test item, and not on the objective, is likely to result in information-ridden test material. The taxonomic classification reminds the item writer of the need to take into account this important aspect of an item. The content of an item is valid to the extent that it corresponds to the objective it is intended to test through a given unit of its content.

### 6. Facilitating the planning of tests and the interpretation of results

In planning a test it is essential to decide what weight should be given to the different objectives, and planning is easier if the examiner has a clear understanding of their hierarchical classification. This classification can be used as an aid in determining the value and significance of the test. Similarly, in interpreting test results, account must be taken of the objectives and their relative standing in the hierarchical structure. Scores can be analysed according to the objectives, and the value of the learner's achievement can be appraised more meaningfully. This appraisal has a diagnostic value and may be used to improve the instruction. Depending on the level of performance in respect of the different objectives, emphasis can be laid in the instructional programmes on those objectives which are more difficult to attain. Thus taxonomic classification is useful in raising the educational value of achievement testing.

## RECOMMENDATIONS

While there are definite advantages in using taxonomic classification for constructing and improving achievement tests, they also involve difficulties. To start with, the construction of test items and other evaluation devices at higher levels in various domains is very exacting; it requires a mastery of the methodology of test development and creativity in the production of items. As the classification is hierarchical, the lower classes are included in the next higher class, and this overlap is often an element of confusion in test construction. These difficulties are particularly acute at the initial stages in the process of developing "objective" tests. However, practice and experience gradually give the examiner confidence and help him to use taxonomies.

Taxonomies are indispensable tools for teachers, enabling them to define educational objectives with due precision.

For some teachers, painstaking development of detailed objectives for their courses becomes a sort of religion. Others have heard about this approach and its potential value in improving the quality of their instruction, but have somehow, so to say, become completely immune to it since their first exposure to it. Finally, there are teachers, the great majority, whose many different tasks absorb the too short time available to them, but who would like to be informed. However, more than this is required: they must be trained.

* * *

## Formative and summative evaluation*

You will find the following equivalents in the literature for these two expressions:

| Formative evaluation | Summative evaluation |
|---|---|
| diagnostic evaluation | certifying evaluation |

1. → Formative evaluation
   - aims at informing the student on the amount of learning he still has to make towards achieving educational objectives;
   - consists in evaluating the PROGRESS or the GAINS made by the student from the moment he commences a curriculum until the time he completes it;
   - enables the curriculum to be adjusted in accordance with the progress made, or its absence;
   - SHOULD IN NO WAY BE USED BY THE TEACHER TO MAKE A CERTIFYING JUDGEMENT; the anonymity of the student should be safeguarded (he can use a code of his own choice);
   - is very useful in assisting the student to ask for help and the teacher to provide help;
   - provides the teacher with qualitative and quantitative data for changing his teaching, or leaving it unchanged (including educational objectives).
2. → Summative evaluation
   - serves traditionally for rank-ordering students and justifying decisions regarding their passage to the following year or the obtaining of a degree;
   - is effected at the end of a unit of instruction (or group of units).

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[*] Read the article by C. MacGuire - diagnostic examinations in medical education. Public Health Papers No. 52.

3. This distinction between FORMATIVE evaluation and SUMMATIVE evaluation can also apply to curriculum evaluation.

Scriven terms "formative" the evaluation employed to improve a curriculum during its implementation. The inadequacies and strong points of the curriculum are identified during its application and in some cases adjustments can be made to remove certain weaknesses. Summative evaluation, on the other hand, is the final evaluation of the curriculum. It represents an effort to reach general conclusions of the type required to justify a decision to replace one curriculum by another or to accept (reject) a given curriculum, book, teaching material, etc. Although formative evaluation is normally carried out by the personnel participating in curriculum improvement whereas summative evaluation is more often undertaken by those who are not directly engaged therein, the distinction between the two concepts is not as clear-cut as might appear. It can be argued, for example, that formative evaluation is only a step in the direction of summative evaluation.[1]

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[1] In: Evaluation of school performance. IBE Bulletin No. 184 (1972). The reader is referred to this very instructive publication.

➡ EVALUATION ...............

...... of WHOM ?

...... of WHAT ?

1. STUDENTS

2. TEACHERS

3. PROGRAMMES AND COURSES

➡ ....... in relation to WHAT ?

☞ In relation to EDUCATIONAL OBJECTIVES.

They are

the common denominator.

## STUDENT EVALUATION : WHAT FOR

- ⑰ INCENTIVE TO LEARN
- ⑱ FEEDBACK TO STUDENT
- ⑲ Modification of LEARNING ACTIVITIES
- ⑳ SELECTION OF STUDENTS
- ㉑ SUCCESS OR FAILURE
- ㉒ FEEDBACK TO TEACHER
- ㉓ SCHOOL PUBLIC-RELATION
- ㉔ PROTECTION OF SOCIETY

APPROPRIATE MEASURING TECHNIQUES

Numbers found in left side column refer to exercise page 346

## Aims of evaluation*

1. To differentiate between failure and success by the student. This was the conventional role of examinations (summative evaluation).
2. To provide "feedback" for the student; to keep him constantly informed about the instructions he is receiving; to tell him what level he has reached; and to enable him, through the questions, to realize what parts of the instructions he has not understood (formative evaluation).
3. To provide "feedback" for the teacher; to make him eventually aware that a fairly large group of students have not understood the instruction he sought to give them; and to enable him, when necessary, to correct his teaching so as to ensure that the matter he seeks to communicate to the students is correctly understood (formative evaluation).
4. The "reputation of the school" is something whose importance is not always evident in European schools, since their reputation is based not on an examination system but on a long-standing tradition. On the other hand, North American medical schools, for example, customarily make known the percentage of students who have passed "National Board of Medical Examiners" examinations (formative evaluation).
5. Protection of society. It is the teacher's responsibility towards society. One should know the extent to which graduates constitute a potential danger (summative evaluation).

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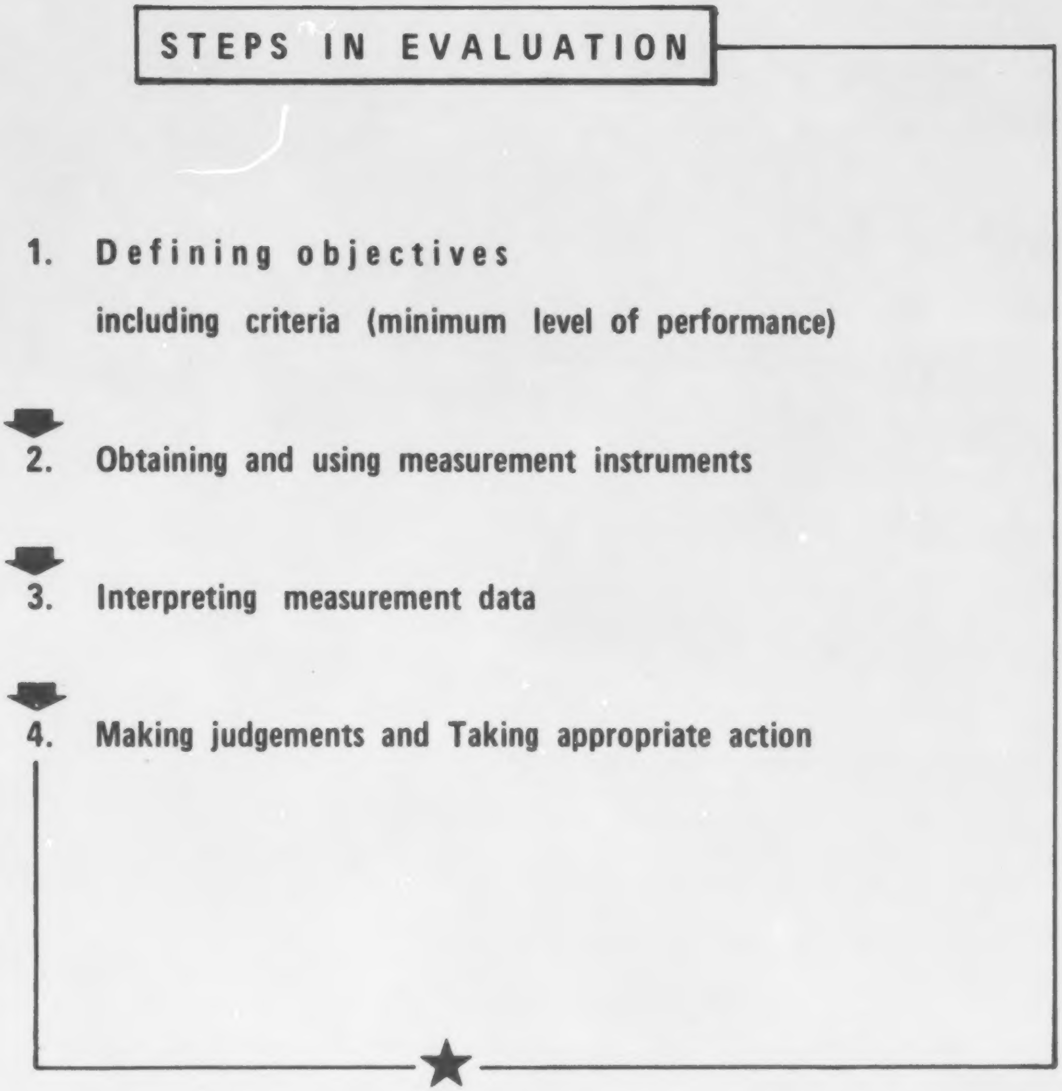
* Adapted from Downie, N. M. Fundamentals of Measurement: Techniques and Practices. New York: Oxford University Press, 1967.



## STEPS IN EVALUATION

1. **Defining objectives**
   including criteria (minimum level of performance)
2. Obtaining and using measurement instruments
3. Interpreting measurement data
4. Making judgements and Taking appropriate action

## COMMON METHODOLOGY FOR EVALUATION

★ of cognitive processes

★ of attitudes

★ of skills

1. Make a list of observable behaviours showing that the objective pursued has been reached.*
2. Make a list of observable behaviours showing that the objective pursued has not been reached.*
3. Determine the essential behaviours in both lists.
4. Give positive or negative weighing to the components of these two lists.
5. Define the minimal performance score.

+ Obtain the agreement of several experts for the last three stages.

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* Behaviours are expressed positively in the two lists.

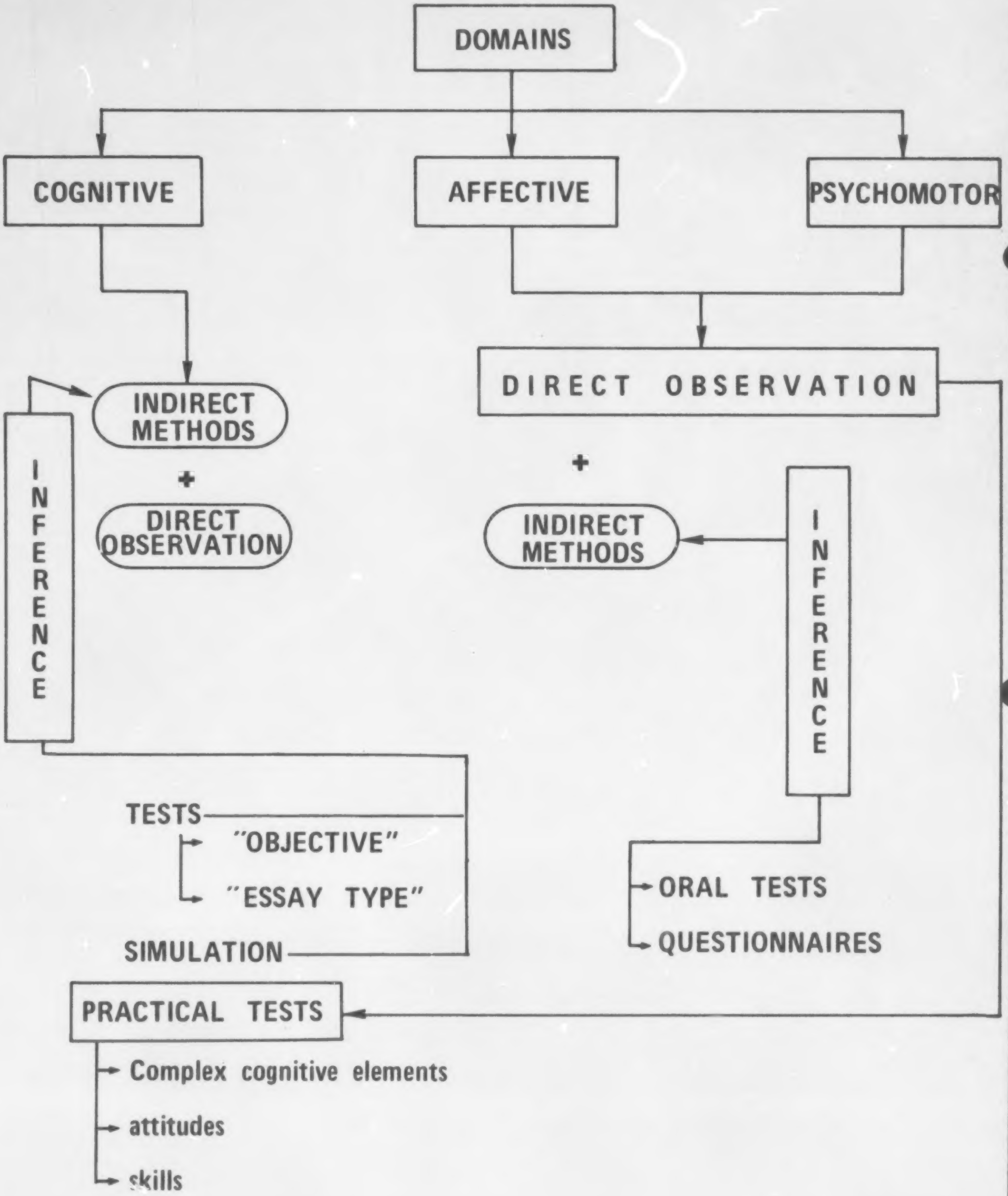
Example: Objective: sympathetic attitude towards a sick child.

At the two extremities of a descriptive scale of values there could be:

Cuddles the patient . . . Slaps the patient's face.

See also Rezler, Public Health Papers No. 52, pp. 70-83.

# LEARNING OBJECTIVES AND METHODS OF EVALUATION


DOMAINS
COGNITIVE
AFFECTIVE
PSYCHOMOTOR
INDIRECT METHODS
+
DIRECT OBSERVATION
INFERENCE
DIRECT OBSERVATION
+
INDIRECT METHODS
INFERENCE
TESTS
"OBJECTIVE"
"ESSAY TYPE"
SIMULATION
ORAL TESTS
QUESTIONNAIRES
PRACTICAL TESTS
Complex cognitive elements
attitudes
skills

NOW . . .

Exercise:

For each of the 9 objectives you have already defined (page 165), choose one of the methods of evaluation (on page 324) which you feel is best for informing you and informing the student on the extent to which each objective has been achieved:

| Objective | Method of evaluation | |
|---|---|---|
| 1 page 149 | Indirect method = completion type question | examples |
| 2 page 149 | Indirect method = questionnaire | |
| 3 page 149 | Direct observation = practical examination | |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |

## Attitude measurement

The term "attitude" refers to certain regularities (consistencies) of an individual's feelings, thoughts and predispositions to act in response to an aspect of his environment (affective domain). An attitude is usually thought of as a hypothetical construct, not directly open to observation but which can be inferred from verbal expression or overt behaviour.

Attitudes are probably not innate. An individual's entire personality structure and hence all his behaviour may be thought of as organized around a central value system composed of many related attitudes.

Contemporary research seems to show that it is unrealistic to hope to be able to change basic attitudes in the relatively short period of an educational programme. Consequently it would seem preferable to make sure, by means of suitable selection, that students have attitudes appropriate to their future profession on entry. We must, however, remember that the definition of these attitudes may readily lend itself to dispute, so that their preparation must be of a collective nature and exclude any arbitrary judgement. Moreover, it would be wise to carry out thorough, controlled experiments before taking any action on the basis of results obtained in attitude measurement. In the face of such a situation it is not unreasonable to consider the drawing of lots as a method of selection.

The attitude of the physician and of other members of the health team towards the patient and his family is universally recognized as having very great importance.

However, on considering the manner in which the performance of students in this field is measured, it is found to be so faulty that it is impossible not to be struck by such a paradoxical situation.

It must be admitted, in all humility, that this is certainly the field where measurement is most difficult and we should support the efforts of those who are undertaking relevant research. There can be no question of dealing with this problem thoroughly within the limits of the present superficial study and the reader should consult specialized publications (see references).

Scales are utilized to evaluate reactions, attitudes, and student activities. Because of the ease with which they can be used, many sources of error in evaluation are often overlooked.

If we wish, in observing a student who is examining a patient, to evaluate separately the extent to which the student gives the patient confidence, the following scale may be used, either in numerical form (on the right) or in graphical form (on the left):

| | |
|---|---|
| The student has taken all the necessary precautions and the patient seems completely relaxed | 5 |
| The student has taken the necessary precautions and has on several occasions reinforced the patient's confidence | 4 |
| The student has made an effort in this direction and has noted the result | 3 |
| The student has made an effort without attempting to determine the result | 2 |
| The student does not appear to have even envisaged the problem | 1 |

These two examples show the scales most frequently used. For other scales see Rezler, A. D. The assessment of attitudes, Public Health Papers No. 52, pp. 70-83 and Guilford, J. P. Psychometric Methods, McGraw Hill, 1954.

In order to draw up questions for evaluating attitudes, a list of statements is prepared reflecting both attitudes deemed favourable and those deemed unfavourable in regard to the characteristic being measured . . .

**Exercise** . . .

Draw up scales for evaluating attitudes expressed in educational objectives you prepared on page 165.

# EVALUATION "BY" THE STUDENTS[1]

## I. Introduction

Student evaluation provides the teacher with a feedback regarding the quality of his teaching. However, this feedback is of an overall nature and anyone who really wishes to improve his teaching will want to know more and must therefore request the student's opinion. Such an approach may go no further than a friendly discussion with a few students, or can lead to the preparation and distribution of a questionnaire. In the latter case one may speak of an evaluation of the course BY the students. The evaluation questionnaire can deal with the whole or some special aspect of teaching: it is the teacher who decides what he wishes to have evaluated by the students. In the event, for example, of a change having been made in teaching (re-organization, utilization of audio-visual equipment) it is extremely useful for the teacher to obtain the opinions of the students on that change.

It may be noted that anyone who asks students to evaluate his teaching need not doubt the validity of their judgement. For a decade or so many psychometric studies have revealed the validity and the accuracy of student opinions as well as their close correlation with "objective" measurements of the instructor's effectiveness. The many biases which were ascribed to the evaluators, for example, the influence of sex, academic efficiency, (poor students/good students), level of studies (beginners, finishers) the status of the course (compulsory/optional) have all proved to be of negligible importance.

## II. Preparation of "simple" evaluation questionnaires

Once the teaching aspects which are to be evaluated have been determined, the evaluation questionnaire is drawn up.

This questionnaire must comply with several essential requirements as concerns the wording of the statements, the scale of the answers and the method of "administration".

### 1) Wording of the statements

(a) The statements should be clear, simple and directly related to what it is desired to measure;

(b) statements which would be accepted straight away by everyone should not be included;

(c) statements containing double negatives should be rejected;

(d) each statement should contain a complete thought;

(e) the terms "uniquely", "solely", or "most of the time" should be avoided or used in moderation;

(f) a statement should preferably be in the form of an affirmation concerning which the student is asked to express a favourable, neutral or unfavourable opinion;

(g) the number of statements should be limited. Too long a questionnaire wearies the evaluators and this inevitably affects the validity of the answers. It is estimated that a questionnaire should not exceed 60 statements.

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[1] Summary of a paper presented by J.-F. d'Ivernois, 21 May 1975, Seminaire de Pédagogie universitaire, Laval University, Quebec.

### Examples of statements

> "Specific objectives make it possible to identify what is most important in the content to be learned".
>
> "The time allocated for a lesson is sufficient for you to achieve all the objectives aimed at in that lesson".

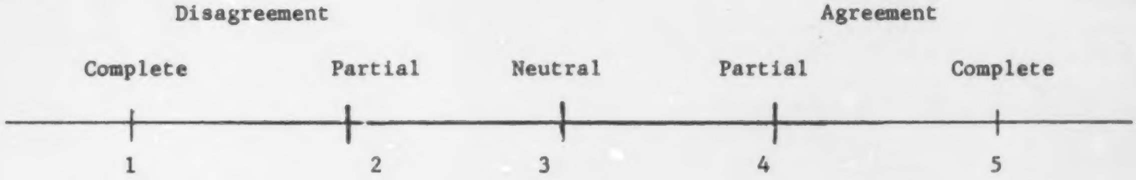
### 2) Scale of answers

The student should not have to answer merely "yes" or "no" to a statement, for such an answer provides only scanty or dubious information.

That is why preference is given to the use of scales of answers comprising 5 degrees (and sometimes 7 or 9).

Such a scale ranges from disagreement (1 and 2) through neutral (3) to agreement (4 and 5).

Example:



Students should enter against each statement (or on an answer-form or card) the numbers corresponding to their opinion. It is advisable to provide for an additional answer figure (0 to 9) corresponding to a lack of opinion concerning the statement.

The answers scale should be explained to the students at the beginning of the questionnaire, or mentioned against each statement. It is also as well to leave a space below each statement for comments by the student.

### 3) Method of administration

A person's reaction to a given stimulus is first immediate and then delayed. If the questionnaire is handed out immediately after the stimulus the results observed will be different from those obtained if the questionnaire is administered later. These differences in distribution are attributable to the effect of experience* or familiarity. The teacher should therefore take this factor into account when he envisages the administration of an evaluation questionnaire.

### 4) Analysis and interpretation of the answers

Processing (machine or manual) of the answers is simple. The answers to a given statement are then analysed by calculating the number of students (frequency) who have replied by 1, 2, 3, 4, 5 or 9 to that statement. The mean of the answers to the statement can also be calculated. To do this one point is assigned to an answer "1"; two points to an answer "2"; three points to an answer "3"; etc. The total of the number of points obtained for the statement is calculated and then divided by the number of students answering. To make interpretation easier, the trends (favourable, unfavourable) should be grouped together.

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* also called "practice effect"

**Example**

Statement 12 : "The time allocated to a lesson is sufficient for you to achieve all the objectives aimed at in that lesson".

Number of answers : 100

Distribution : 1 : 3     3 : 5     5 : 69
2 : 2     4 : 21     9 : 0

Trends : 1-2 (disagreement) : 5
4-5 (agreement) : 90

Mean of answers : 4.51

## III. Construction of complex questionnaires

1) "Simple" questionnaires enable the students' perception of REALITY to be measured. It is for the teacher who analyses the answers to deduce from them what the students desire or expect, but this interpretation may leave certain grey zones. If, for example, the statement submitted is: "the course provides an adequate coverage of the subject matter" and 40% of the students disagree with that statement then it is clear that these students feel that the course does not cover sufficient subject matter. On the other hand, what proportion of the 50% of students who agree with the statement think that the subject matter covered is not only adequate but even too much?

"Complex" evaluation questionnaires, such as the one devised by F. Gagné, covering the perception by the students of the teacher/students relationship have the aim of measuring as unambiguously as possible both the students' perception of REALITY and their level of expectations.

In a questionnaire of the Gagné type, each statement should include:

(a) a TITLE;

(b) a DETAILED DESCRIPTION of the aspect to be measured;

(c) a 5 degree SCALE with QUALITATIVE EXPRESSION of each degree;

(d) TWO QUESTIONS : the first (A) measuring the students' perception of reality and the second (B) the level of his expectations.

FREQUENCY OF EXAMPLES : What is required to measure the frequency of examples putting in concrete form the more or less abstract concepts presented in the course.

1. VERY RARE examples
2. RARE examples
3. MORE OR LESS FREQUENT examples
4. FREQUENT examples
5. VERY FREQUENT examples

Question A : Where would you place this course on the evaluation scale?

Question B : Where should it be in order to satisfy you?

## 2) Analysis and interpretation

The *means* of the answers to question A (Reality) and B (Expectations) are calculated for each statement. Interpretation of these two means is easy since degree 1 on the scale shown usually corresponds to the minimum frequency or intensity, while degree 5 corresponds to maximum frequency or intensity (see example). The *deviation* between these two means is then calculated (S score). This deviation shows the dissatisfaction of the students, a dissatisfaction expressed in terms of a *lack* or an *excess*. The lower the value of the S score (the nearer it is to zero) the more the particular aspect measured is deemed satisfactory. The S scores of several statements can be compared with one another for one and the same group of students. Furthermore, all the S scores in the questionnaire can be added together so as to give an overall and valid measurement of satisfaction or dissatisfaction. Finally, it should be noted that a questionnaire of the Gagné type can be adapted to different educational methods, e.g. lecture courses, small group activities, teaching by computer, by television, etc.

EXAMPLE OF INTERPRETATION OF A QUESTIONNAIRE OF THE GAGNE TYPE

| Statement | Title of statement | Mean : Reality | Mean : Desires | Deviation (S score) | Interpretation |
|---|---|---|---|---|---|
| 4 | Variation in educational approach | 2.39 | 3.74 | 1.52 | Dissatisfaction (lack) |
| 13 | Active student participation (+ or -) | 4.26 | 4.65 | 0.39 | Satisfaction |
| 27 | Number of references to be consulted | 4.51 | 3.27 | 1.24 | Dissatisfaction (excess) |

See references concerning this article on page 515 *et seq*.

* * *

Now . . . construct a questionnaire that would enable participants to your next course to express their opinion concerning its quality.

# EVALUATION IN EDUCATION
# THE CONCEPTS OF VALIDITY AND RELIABILITY

## 1. Some definitions

1.1 It should be recalled once more that education is defined as a process developed for bringing about changes in the student's behaviour. At the end of a given learning period there should be a greater probability that behaviours regarded as desirable will appear; other behaviours regarded as undesirable should disappear.

1.2 The educational objectives constitute the desired behaviours as a whole for which the teacher should prepare a suitable environment where the student can acquire them.

1.3 Evaluation in education is a systematic process which enables the teacher to "measure" to what extent the student has attained the educational objective. The evaluation always includes measurements (quantitative or qualitative) plus a value judgement.

1.4 To make measurements, measuring instruments must be available which satisfy certain requirements so that the results can signify something to the teacher himself, the school, the student, and society which, in the final analysis, has set up the educational structure.

1.5 In education, the measuring instruments are generally referred to as "tests".

1.6 Among the requisite qualities of a test, whatever its nature, four are essential, namely, validity, reliability, objectivity and relevance. Others are also important, but they contribute in some degree to the qualities of validity and reliability.

## 2. Qualities of a measuring instrument

The four main qualities of any measuring instrument (examination) are: validity, reliability, objectivity and relevance.

2.1 Validity: the degree of precision with which the test employed really measures what it is intended to measure. There should be no outside factors to interfere with the manner in which the evaluation is carried out. For instance, in measuring the ability to synthesize, other factors, such as style should not compete with the element to be measured so that what is finally measured is style rather than the ability to synthesize.

It is a concept which relates to the results obtained with a test and not to the test itself. It relates more specifically to the interpretation of the results obtained by means of the test.

The concept of validity is a very relative one. It implies a concept of degree, i.e. one may speak of very valid, moderately valid or not very valid results.

The concept of validity is one which is always specific for a particular subject. For example, results of a test of public health administration may be of very high validity for identification of the needs of the country and of little validity for a cost/benefit or cost/efficiency analysis.

Content validity answers the following question: will this test measure, or has it measured, the matter and the behaviour that it is desired to measure?

Predictive validity answers the following questions when it is desired to use the results of a test for predicting the performance of a student in another domain or in another situation:

To what extent do the results obtained in physiology help to predict performance in pathology?

To what extent do the results obtained during the pre-clinical years help in predicting the success of students during the clinical years?

2.2 Reliability: this is the consistency with which an instrument measures a given variable.

Reliability is always connected with a particular type of consistency: the consistency of the results in time; consistency of results according to the questions; consistency of the results according to the examiners.

Reliability is a necessary, but not sufficient, condition for validity. In other words, validity results must necessarily be reliable, but reliable results are not necessarily valid. Consequently, results which are not very reliable affect the degree of validity. Unlike validity, reliability is a strictly statistical concept and is expressed by means of a reliability coefficient or through the standard error of the measurements made

Reliability can therefore be defined as the degree of confidence which can be placed in the results of an examination. It is the consistency with which a test gives the results expected.

2.3 Objectivity: this is the degree of concordance between the judgements of independent and competent examiners as to what constitutes a "good" answer for each of the items of a measuring instrument.

2.4 Relevance: this is the degree to which the criteria established for selecting questions (items) conform to the aims of the measuring instrument are respected. This notion is almost identical to the one of content validity. In any case, both these qualities are established in a similar manner.

## 3. Other qualities of a measuring instrument

3.1 Equilibrium: the degree of concordance between the proportion of questions allocated to each of the objectives and the ideal proportion for an instrument of this kind.

Equity: degree of concordance between the questions set in the examination and the teaching content.

Specificity: quality of a measuring instrument whereby an intelligent student who has not followed the teaching on the basis of which the instrument has been constructed will obtain a result equivalent to that expected by pure chance.

Discrimination: quality of each element of a measuring instrument which makes it possible to distinguish between good and poor students in relation to a given variable.

Efficiency: quality of a measuring instrument which ensures the greatest possible number of independent answers per unit of time.

Time: it is wellknown that a measuring instrument will be less reliable if it leads to the introduction of nonrelevant factors (guessing, taking risks or chances etc.) because the time allowed is too short.

Length: the reliability of a measuring instrument can be increased almost indefinitely (Spearman-Brown formula) by the addition of new questions equivalent to those constituting the original instrument.

## VALIDITY

The degree of accuracy with which the instrument measures what it is constructed to measure

*

## RELIABILITY

The consistency with which an instrument measures a given variable.

*

## OBJECTIVITY

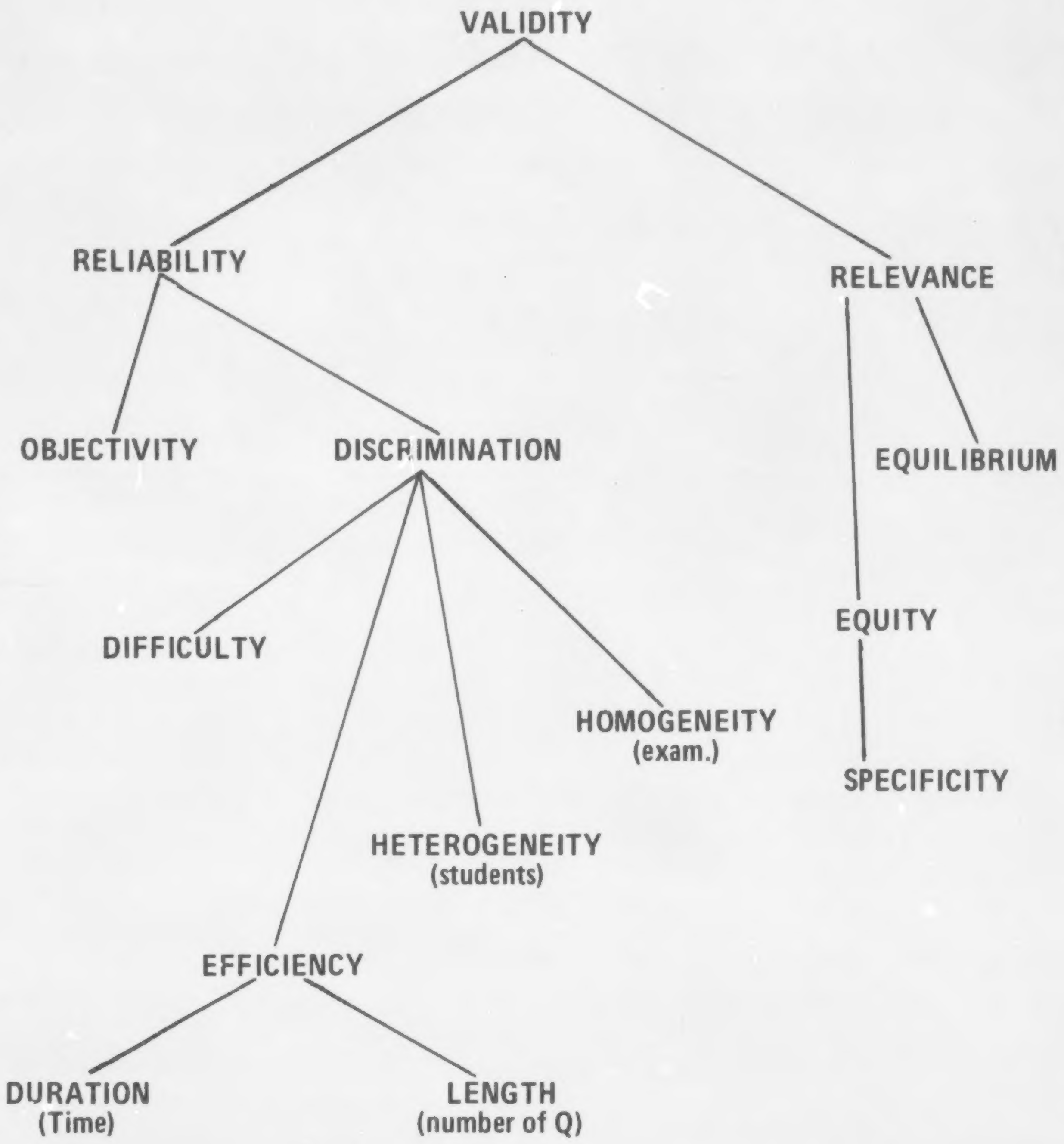
The degree of concordance between the judgements of independent and competent examiners as to what constitutes a good answer to each of the elements of a measuring instrument.

*

## RELEVANCE

Extent to which the criteria established for selecting questions so that they conform to the aims of the measuring instrument are respected.

## RELATIONS between CHARACTERISTICS of an EXAMINATION*


VALIDITY
RELIABILITY
RELEVANCE
OBJECTIVITY
DISCRIMINATION
EQUILIBRIUM
DIFFICULTY
EQUITY
HOMOGENEITY (exam.)
SPECIFICITY
HETEROGENEITY (students)
EFFICIENCY
DURATION (Time)
LENGTH (number of Q)

*as proposed by G. CORMIER Universite Laval, Quebec.

## RELATIONSHIPS BETWEEN THE CHARACTERISTICS OF AN EXAMINATION

The diagram on the previous page, suggested by G. Cormier, represents an attempt to sum up the concepts of docimology worked out by a number of authors. However, no diagram can give a perfect representation of reality and the purpose of the following lines is to explain, rather than defend, the diagram.

A very good treatment of all these concepts will be found in the book by Robert Ebel entitled Measuring Educational Achievement (Prentice Hall, 1965)

### Validity and reliability

Ebel shows that, to be valid, a measuring instrument (test) must be both relevant and reliable. This assertion justifies the initial dichotomy of the diagram. It is, moreover, generally agreed that a test can often, if not always, be made more valid if its reliability is increased.

### Validity and relevance

According to Ebel's comments, it seems that the concept of relevance corresponds more or less to that of validity of content. In any case, both are established in a similar manner.

By definition, a question is relevant if it adds to the validity of the instrument, and an instrument is relevant if it respects the specifications (objectives and taxonomic levels) established during its preparation.

### Relevance and equilibrium

It seems, moreover, that the concept of equilibrium is only a sub-category of the concept of relevance and that is why the diagram shows it as such.

### Relevance and equity

It seems evident that if the instrument is constructed on the basis of a content itself determined by objectives, then it will be relevant by definition. If this is not done, then the instrument will not be relevant and consequently not valid. It is equitable in the first case and non-equitable in the second. However, an examination can be equitable without being relevant (or valid) when, although it corresponds well to the teaching content, the latter is not adequately derived from the objectives.

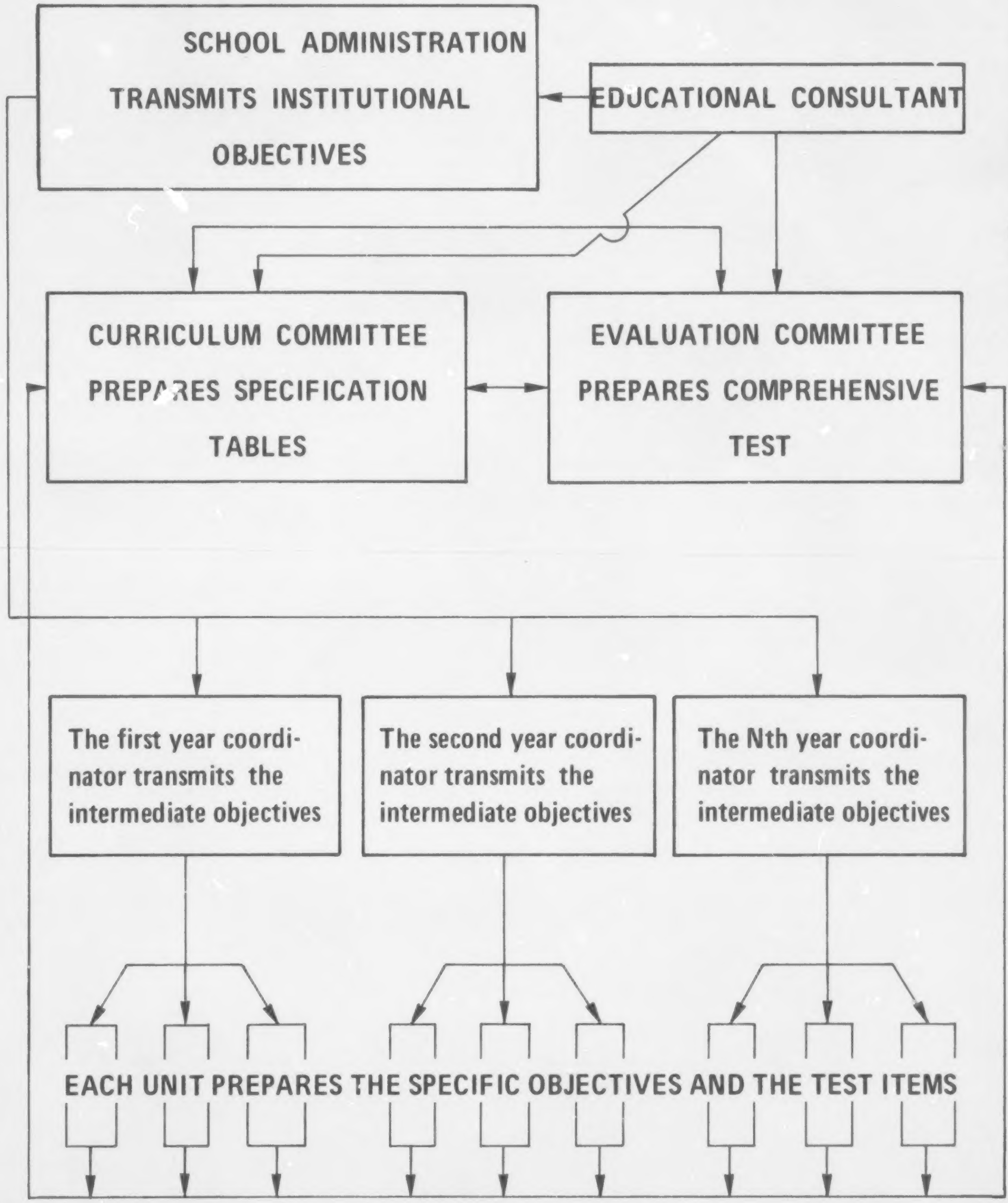
### Equity, specificity and reliability

The diagram reflects the following implicit relationship: a test cannot be equitable if it is not first specific. Moreover, specificity, just like equity and for similar reasons, will affect the reliability of the results.

### Reliability, discrimination, length, homogeneity (of questions) and heterogeneity (of students)

According to Ebel reliability is influenced by the extent to which the questions (items) clearly distinguish competent from incompetent students, the number of items, the similarity of the items as regards their power to measure a given skill and the extent to which students are dissimilar with respect to that skill. The discriminating power of a question is directly influenced (see pages 469-470) by its level of DIFFICULTY. The mean discrimination index of an instrument will also be affected by the HOMOGENEITY of the questions and the HETEROGENEITY of the students. From the comments made above it can be seen how EQUITY and SPECIFICITY will also influence the discriminating power of the instrument.

# ORGANIZATION DIAGRAM SHOWING RELATIONSHIPS BETWEEN CURRICULUM COMMITTEE, EVALUATION COMMITTEE AND TEACHING UNITS


SCHOOL ADMINISTRATION TRANSMITS INSTITUTIONAL OBJECTIVES
EDUCATIONAL CONSULTANT
CURRICULUM COMMITTEE PREPARES SPECIFICATION TABLES
EVALUATION COMMITTEE PREPARES COMPREHENSIVE TEST
The first year coordinator transmits the intermediate objectives
The second year coordinator transmits the intermediate objectives
The Nth year coordinator transmits the intermediate objectives
EACH UNIT PREPARES THE SPECIFIC OBJECTIVES AND THE TEST ITEMS

## EXERCISE

Show graphically the type of organization (commissions, committees, administrations, etc., with a description of their functions) which you feel desirable (in the establishment where you are teaching) for introducing (or improving) an EVALUATION system capable of providing the necessary data for checking that all INSTITUTIONAL objectives have been achieved (do not forget also to take account of the decisions you have formulated on page 307); then compare with page 340.

EXERCISE

Describe the obstacles you are liable to encounter in applying the organizational plan you have imagined on the previous page AND indicate tactics for overcoming each of these obstacles.

| OBSTACLES | TACTICS |
|---|---|
| | |

**EXERCISE** (check your answers against page 348)

Instructions: For each question select ONE answer

**Question 1** All the following steps, EXCEPT ONE, are essential in constructing any measuring instrument.

A. Precisely defining all the aspects of the type of competence to be measured.
B. Obtaining reliability and validity indices for the proposed instrument.
C. Making sure that the type of instrument selected corresponds to the type of competence to be measured.
D. Making sure that the measuring instrument is objective.
E. Determining the particular behaviour expected from individuals who have, or have not acquired, the specified competence.

**Question 2** A test set at the beginning of a learning period (formative pre-test) has all the following advantages EXCEPT ONE. It makes it possible to:

A. modify the educational objectives of that period.
B. devise mechanisms enabling less well prepared students to catch up.
C. change the required pass mark.
D. serve as a basis of comparison for measuring the real progress made.
E. exclude inadequate students from the learning period.

**Question 3** The main role of evaluation is:

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**Question 4** The purpose of evaluation is to make a valuable judgment concerning:

A. Students and curricula.
B. Students and teachers.
C. Curricula and teachers.
D. Students.
E. None of the above statements.

**Question 5** The four steps of the Evaluation process are the following:

1. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
2. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
3. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
4. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**Questions 6 to 10** - For each question indicate to which of the following it refers to:

A. Formative evaluation.
B. Summative evaluation.
C. Both.
D. Neither.

Question 6 Its main aim is to inform student on his/her progress.

Question 7 Anonymity is not preserved.

Question 8 Enables the teacher to replace a programme by another.

Question 9 Enables to justify if a student passes or fails.

Question 10 Enables rank-ordering of students.

**Question 11** Thorndike's "Law of Effect" is based on the fact that:

A. Students learn better when they are motivated.
B. Students learn better when they play an active role.
C. Students are receptive when they understand the educational objectives which have been defined.
D. Students tend to carry on those studies which have success associated with their results.
E. Students work better if the teacher makes an impression on them.

**Questions 12 and 13** As regards the following qualities that can be attributed to an examination:

A. = Validity B. = Objectivity C. = Reliability

D. = Specificity E. = Relevance

12. What quality is obtained if a group of experts agree on what constitutes good answers to a test?

13. What quality implies that a test consistently measures the same thing?

**Question 14** The following factors, EXCEPT ONE, generally affect the reliability of a test:

A. The objectivity of a test.

B. The mean discrimination index of the test questions.

C. The homogeneity of the test.

D. The relevance of the test questions.

E. The number of questions in the test.

**Question 15**

Which of the following test criteria is influenced by all the others?

A. Reliability.

B. Validity.

C. Objectivity.

D. Specificity.

E. Relevance.

**Question 16**

The most essential variable to be considered in evaluating the results of teaching is:

A. The student's performance.

B. The opinion of the teacher and his colleagues.

C. The opinion of the student regarding his performance.

D. The satisfaction of the teacher and the students.

E. The teacher's performance.

**Questions 17 to 24**

For each of the aims of student evaluation (list numbered from 17 to 24, page 320) indicate whether SUMMATIVE evaluation (S) or both SUMMATIVE and FORMATIVE evaluation (SF) will assist in attaining such aims.

**Question 25**

When evaluating attitudes (domain of affective objectives) all the following steps should be taken EXCEPT ONE:

A. Define explicit behaviours showing a given affective measure.

B. Define explicit behaviours showing the absence of a given affective level.

C. Observe students in real situations enabling them to manifest the behaviours envisaged.

D. Obtain the agreement of a group of experts on the relationship between explicit behaviours and the affective level envisaged.

E. Obtain the student's opinion on the way in which they would behave in specific situations.

★

For evaluation the essential quality is

**VALIDITY**

but

Do not forget that for an educational system considered as a whole

it is its

**RELEVANCE**

that is of primary importance

## Answers suggested for the exercise on pages 344 to 346

| Question | Suggested answer | If you do not find the correct answer, consult the following pages again |
|---|---|---|
| 1 | B | 305, 323, 337 |
| 2 | E | 316-317 |
| 3 | → | 302-303 |
| 4 | E | 318 |
| 5 | → | 322 |
| 6 | A | 316-317 |
| 7 | B | |
| 8 | C | |
| 9 | B | |
| 10 | C | |
| 11 | D | 313 |
| 12 | B | 335-336 |
| 13 | C | 335-336 |
| 14 | D | 336-339 |
| 15 | B | 336-339 |
| 16 | A | 318-323 |
| 17 | SF | 316-317 |
| 18 | SF | |
| 19 | SF | |
| 20 | S | |
| 21 | S | |
| 22 | SF | |
| 23 | SF | |
| 24 | S | |
| 25 | E | 323, 326-327 |

# 4

## TEST AND MEASUREMENT TECHNIQUES
## (DOCIMOLOGY)

This fourth chapter reviews a certain number of measuring instruments, their advantages and limitations, and how they should be used. It shows the wide range of such instruments and the importance of choosing them in accordance with the educational objectives to be measured. It is stressed that every teacher should make a certain minimum of statistical calculations when he carries out an item analysis or calculates the Minimum Pass Level (MPL) of a test.

Those with a deeper interest in these problems are strongly advised to consult the following publications:

★ Public Health Papers - WHO

- No. 36 A review of the nature and uses of examinations in medical education, 1968
- No. 52 Development of educational programmes for the health professions, 1973

★

After having studied this chapter and the references indicated, you should be able to:

1. Define the following terms: prerequisite level test, comprehensive pre-final, partial or pre-test, indicate their purpose and their grading.
2. List the good and the bad features of a test.
3. Compare the advantages and disadvantages of tests.
4. Draw up an "essay question" with criteria for objective scoring.
5. Construct so-called "objective" questions permitting measurement of a high level cognitive process.
6. Indicate the advantages and drawbacks of the programmed examination.
7. Compare the advantages and limitations of relative and absolute criterion testing.
8. Do an item analysis - calculate the minimum pass level for a given test.
9. Fill in a specification table for an examination.

Docimology[1] or the study of tests used in measurement techniques is a fairly new science. It was introduced into the medical teaching world about twenty years ago against some opposition and the problem has certainly aroused the interest of teachers; however, some of them feel that the evaluation "specialists" are trying to poach on their preserves, and that this will limit their academic freedom. This is often due to a lack of information.

This lack of information produces certain defence mechanisms in teachers when the problem is tackled scientifically, making for more heated reactions.

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[1] Examens et Docimologie, Henri Pieron, Collection SUP, Presses universitaires de France, deuxième édition, 1969. (See index, page 606.)

## Basic considerations concerning examinations

Analysis of the most commonly used tests shows that sometimes, often even, the questions set are ambiguous, unclear, disputable, esoteric or trivial. It is essential for anyone constructing an examination test, whether a traditional written examination or an objective test, to submit it to his colleagues for criticism so as to make sure that its content is relevant (related to an educational objective) and of general interest, and does not exclusively concern a special interest or taste of the author; that the subject is interesting and real for the general practitioner or for physicians with a specialty different from that of the author; and that the questions (and the answers in the case of multiple-choice questions) are so formulated that experts can agree on the correct response. It is clear that a critical review of the question along these lines would avoid the over-simplification of many tests which only too often justify a conclusion such as: "the more you know about a question the lower will be your score".

The author of a question is not the best judge of its clarity, precision, relevance and interest. Critical review of the question by colleagues is consequently essential for a well-constructed test.

Moreover, an examination must take the factor of practicability into account, and this will be governed by the time necessary for its construction and administration, scoring and interpretation of the results, as well as general ease of use.

If the examination methods employed become a heavy burden on the teacher because of their impractical nature he will tend to assign less importance than it warrants to the measuring instrument.

* * *

## QUALITIES OF A TEST[1]

- Directly related to educational objective
- Realistic & practical
- Important & useful
- Complete but brief
- Precise & clear

* * *

---

[1] and study again (p. 338) the relations between characteristics of an examination.

## Considerations of the type of competence a test purports to measure

No test format (objective, essay or oral) has a monopoly on the measurement of the higher and more complex intellectual processes. Studies of various types of tests support the view that the essay and the oral examination, as commonly employed, test predominantly simple recall and, like the objective tests in current use, rarely require the student to engage in reasoning and problem-solving. In short the form of a question does not determine the nature of the intellectual process required to answer it.

Second, there is often a tendency to confuse the difficulty of a question with the complexity of the intellectual process measured by it. However, it should be noted that a question requiring simple recall may be very "difficult" because of the esoteric nature of the information demanded; alternatively, a question requiring interpretation of data or application of principles could be quite "easy" because the principles of interpretation are so familiar and the data to be analysed so simple. In short, question difficulty and complexity of instructions are not necessarily related to the nature of the intellectual process being tested.

Third, there is often a strong inclination to assume that any question which includes data about a specific case necessarily involves problem-solving, whereas, in fact, "data" are often merely "window dressing" when the question is really addressed to a general condition and can be answered equally well without reference to the data. Or, the data furnished about a "specific case" may constitute a "cut-and-dried", classical textbook picture that, for example, simply requires the student to recall usually symptoms associated with a specific diagnosis. It is interesting to note that questions of this type can be readily converted into problems that do require interpretation of data and evaluation-simply by making the case material conform more closely to the kind of reality that an actual patient, rather than a textbook, presents.

In short, just as each patient in the ward or out-patient department represents a unique configuration of findings that must be analysed, a test which purports to measure the student's clinical judgement and his ability to solve clinical problems must simulate reality as closely as possible by presenting him with specific constellations of data that are in some respects unique and, in that sense, are new to him.

# STAGES OF ASSESSMENT

- Pre-requisite level testing
- Pre-testing
- Pre – final – feedback – comprehensive testing
- "Subjective" impression
- Final testing
- Safety testing
- Follow-up testing

★

## DIFFERENT TYPES OF EXAMINATIONS DURING A COURSE AND THEIR STAGES

### Prerequisite level test

Before commencing a course it is necessary to ascertain whether the students have reached a certain level, namely the prerequisite level (refer back to page 116). A teacher must specify which knowledge he considers indispensable to ensure that the students assigned to him derive maximum benefit from the instruction he has planned for them. This test shows whether all the students are at this level or whether they are not, in which case coverage of this area must be ensured by modifying the proposed instruction to bring them up to this level. If this is not done the quality of instruction must suffer. Depending on the number of students who need bringing up to this level, the teacher must decide on the type of remedy - either reference to books or additional instruction - for the students concerned, possibly with the assistance of students who have reached the level and can be given the task of "instructor". As far as possible a "repeat" for all the students should be avoided, since this would amount to ignoring the diagnosis obtained by means of the prerequisite level test.

### Pretesting

When a given course commences it is advisable to make sure of the level of the students with respect to the course; on the one hand, this measurement of the starting level will permit the assessment of the real GAIN at the end of a course, on the other - and this has been shown in real situations - it may be found that some students are already quite advanced as regards the objectives envisaged for the course and allowance should therefore be made for this. This is a diagnostic test (see page 316).

### Interval testing

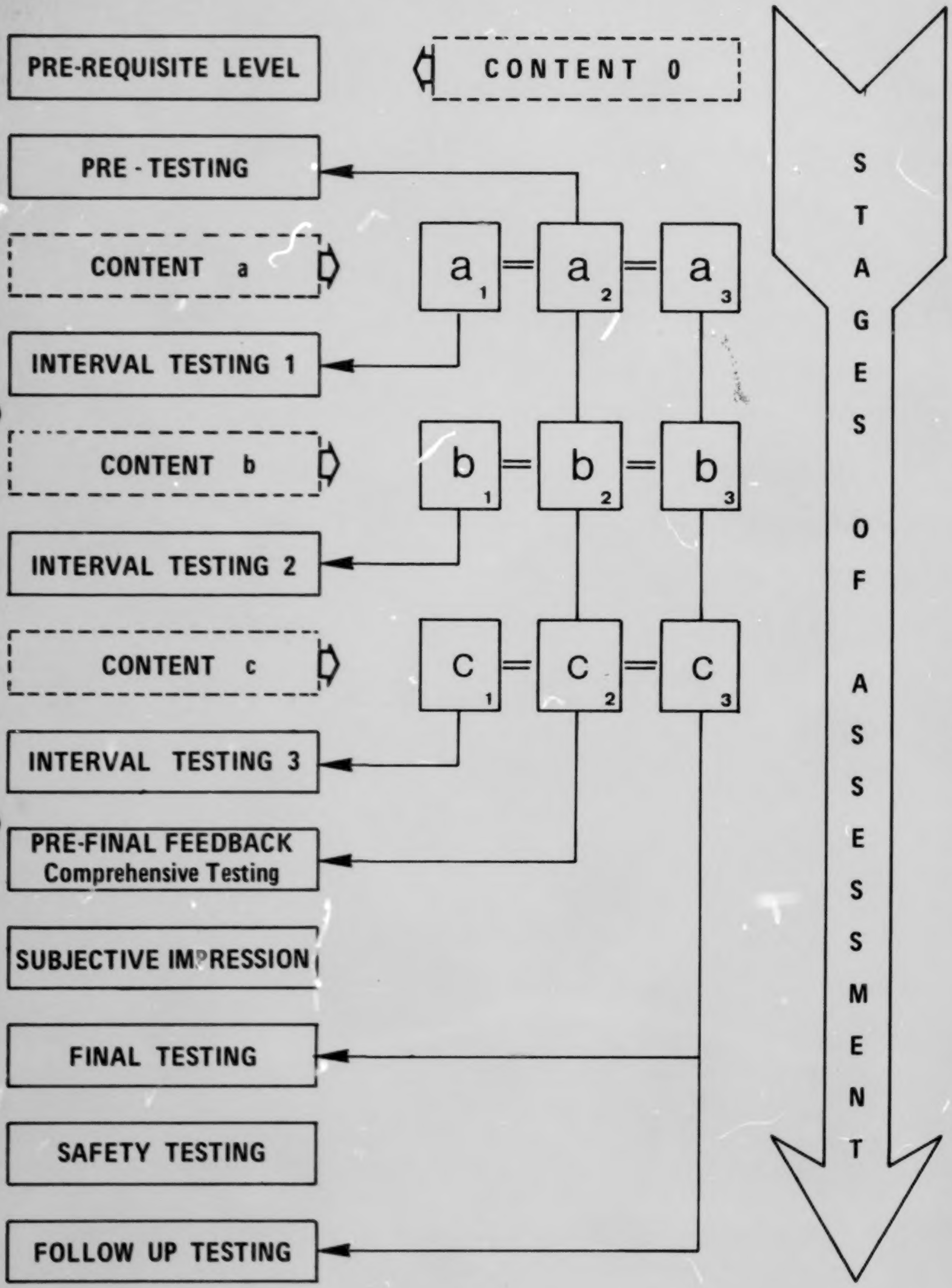
These tests must be set as the course proceeds to give the student the feedback he needs in order to know where he stands after a particular period of instruction. The teacher must see that these tests are, as far as possible, of the same difficulty as the final examination. One way of doing this is to select at random at least three "packets" from a group of questions. These three equivalent packets ($a_1$, $a_2$, $a_3$, see diagram on page 409) will be used not only for interval testing but also for pretesting (formative), pre-final feedback comprehensive testing (formative) and final testing (certifying). Thus, when the student reaches the final examination he will not be haunted by the idea of its difficulty; he will have been brought up to the necessary level beforehand.

### Pre-final feedback comprehensive testing

This is a test of the formative type set before the final examination (comprehensive) of a course or the year (pre-final). Its purpose is to inform the student about his level of competence (feedback) and it should not be limited to a single subject but should cover a group of subjects. This will be facilitated if the school follows an integrated curriculum. If it does not, the teacher must include questions from other fields directly relevant to understanding of the subject taught.

### Subjective impression

Evaluation of this type is carried out on the basis of the teachers' personal knowledge of the students after contact with them during the year: he seeks to divide the students into three categories: good, average and bad. It would perhaps be preferable to divide them into two groups only: satisfactory and unsatisfactory. This evaluation should be carried out before the final examinations at the end of the year. For use see "safety testing".


PRE-REQUISITE LEVEL
CONTENT 0
PRE - TESTING
CONTENT a
a 1
a 2
a 3
INTERVAL TESTING 1
CONTENT b
b 1
b 2
b 3
INTERVAL TESTING 2
CONTENT c
c 1
c 2
c 3
INTERVAL TESTING 3
PRE-FINAL FEEDBACK
Comprehensive Testing
SUBJECTIVE IMPRESSION
FINAL TESTING
SAFETY TESTING
FOLLOW UP TESTING
STAGES OF ASSESSMENT

★

## Final testing

These are of different types: oral, practical, traditional written or multiple-choice questions on patient management problems, etc., according to the educational objectives to be measured and organized, AFTER the end of a course.

★

## Safety testing

This should be carried out if there is an abnormal difference between the "subjective impression" and the results of the final examinations. If a student who was considered satisfactory or good has a bad mark in the final examination, it is essential to re-evaluate the situation and not to give the final examination the role of final and arbitrary sanction which it has so often had in the past.

★

## Follow-up testing

This is a form of evaluation which is carried out sometime after completion of the course to determine the extent to which the student has retained the acquired level of competence.

★

## COMMON DEFECTS OF EXAMINATIONS

- Triviality
- Outright error
- Ambiguity
- Conservatism
- Complexity
- Unintended cues

★

## COMMON DEFECTS OF EXAMINATIONS

Review of examinations currently in use strongly suggests that the most common defects of testing are:

(a) the triviality of the questions asked, which is all the more serious in that examination questions can only represent a small sample of all those that could be asked. Consequently it is essential for each question to be important and useful;

(b) outright error in phrasing the question (or, in the case of multiple-choice questions, in phrasing the distractors and the correct response);

(c) ambiguity in the use of language which may lead the student to spend more time in trying to understand the question than in answering it; in addition to the risk of his giving an irrelevant answer;

(d) forcing the student to answer in terms of the bias or even the outmoded ideas of the examiner, a bias which is well known and often aggravated by the teaching methods themselves (particularly traditional lectures);

(e) complexity or ambiguity of the subject matter taught, so that the search for the correct answer is more difficult than was anticipated;

(f) unintended cues in the formulation of the questions that result in transparency as to the correct answer; this fault which is often found in multiple-choice questions is just as frequent in oral examinations.

★

*

## OUTSIDE FACTORS TO BE AVOIDED

→ Complicated instructions

→ Over-elaborate style

→ Trap questions

→ Ability to pass "tests"

*

## Outside factors

In constructing an examination, outside factors must not be allowed to interfere with the factor to be measured.

### ★Ability to understand instructions

Some tests have instructions for students on how to solve the problems that are so complicated that what is really evaluated is the students' aptitude to understand the question rather than their actual knowledge and ability to use it. This criticism is often made of multiple-choice examinations in which the instructions for students appear too complicated. This complexity is often more apparent than real and disturbs the teacher rather than the student.

### ★Ability to use words

The student may disguise his lack of knowledge in such elegant prose and succeed in influencing the corrector to such an extent that he judges the words and style rather than the student's knowledge.

### ★Ability to avoid traps

This interference does not depend on a measuring instrument, but on possible sadistic tendencies on the part of the examiner, who, during an examination, may allow himself to be influenced by the candidate's appearance, sex, etc. Some candidates are more or less skilled at playing on these tendencies.

### ★Ability to pass tests

This is a criticism that is generally made of multiple-choice examinations; it may in fact be applied to other forms of evaluation. In oral and written examinations, students develop a sixth sense, often based on statistical analysis of past questions, which enables them to somehow predict the questions that will be set.

## COMPARISON OF ADVANTAGES AND DISADVANTAGES OF DIFFERENT TYPES OF TEST

### Oral examinations

| Disadvantages | Advantages |
|---|---|
| 1. Lacks standardization | 1. Provides direct personal contact with candidates |
| 2. Lacks objectivity and reproducibility of results | 2. Provides opportunity to take into account mitigating circumstances |
| 3. Suffers from possible abuse of the personal contact | 3. Provides flexibility in moving from strong to weak areas |
| 4. Suffers from undue influence or irrelevant factors | 4. Requires the candidate to supply his own formulation without cues |
| 5. Lacks an adequate cadre of trained examiners to administer the examination | 5. Provides opportunity to question the candidate about how he arrived at an answer |
| 6. Is excessively costly in terms of professional time in relation to the limited value of the information it yields | 6. Provides opportunity for simultaneous assessment by two examiners. (Unfortunately in practice all those advantages are rarely used.) |

### Practical examinations

| Disadvantages | Advantages |
|---|---|
| 1. Lacks standardized conditions either in laboratory experiments using animals or in bedside examinations with patients of varying degrees of cooperativeness* | 1. Provides opportunity to test in a realistic setting skills involving all the senses while the examiner observes and checks performance |
| 2. Lacks objectivity and suffers from intrusion of irrelevant factors | 2. Provides opportunity to confront the candidate with problems he has not met before both in the laboratory and at the bedside to test his investigative ability as distinguished from his ability to carry out "cook-book" exercises |
| 3. Is of limited feasibility for large groups | 3. Provides opportunity to observe and test attitudes and responsiveness to the total situation |
| 4. Entails difficulties in arranging for examiners to observe candidates demonstrating the skills to be tested | 4. Provides opportunity to test the ability to communicate under pressure, to discriminate between important and trivial issues, to arrange and display the data in a final form |

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* Standardized practical tests can be constructed; see "Simulation and evaluation in medicine" in Public Health Papers No. 61, pp. 18-34.

## Essay examinations

| Disadvantages | Advantages |
|---|---|
| 1. Limits severely the area of the student's total work that can be sampled | 1. Provides opportunity to candidate to indicate his knowledge of and his ability to organize ideas and express them effectively in his language |
| 2. Lacks objectivity | |
| 3. Presents difficulties in obtaining consistent judgements of performance | |
| 4. Provides negligible feedback | |
| 5. Requires excessive time to score | |

## Multiple-choice questions

| Disadvantages | Advantages |
|---|---|
| 1. Requires extended time to construct in order to avoid arbitrary and ambiguous questions | 1. Provides objectivity, reliability and validity |
| 2. Requires adjustment for positive scores that may be achieved by chance or by guessing | 2. Increases significantly the range and variety of facts that can be sampled in a given time |
| 3. Provides cues that are unavailable in practice | 3. Provides opportunity to obtain detailed feedback for both student and faculty |

## Comparison of "objective" and "subjective" examinations[1]

1. The essay test is usually less reliable than the so-called objective test (multiple-choice question, for example).

2. The objective test is usually more valid than the essay test because of its greater sampling of content material.

3. Essay tests are economical in time and effort when it comes to making them; expensive in both of these aspects when it comes to reading and scoring them. The reverse is true for objective tests.

4. Essay tests are cheap from an institutional point of view in that questions may be and often are written on the board and students supply their own paper for their answers. In the making of objective tests especially for large classes, reams of paper are needed.

5. Essay tests save time when the group tested is small. A class of 10 is much more suited to an essay test than a class of 100.

6. Guessing may be a problem on objective tests just as bluffing may be a problem on an essay test.

7. Both may be used to measure the various outcomes of learning such as the application of knowledge to new situations, the solution of problems, the evaluation of material and of ideas, etc. The assessment of such processes is not confined to the peculiar domain of the essay test provided that the essay test builder is skilled in the art of test item writing.

8. In the past it was claimed that a student studied one way for an objective test, in another fashion for the essay test. This was probably true when the objective test did nothing but measure the recognition and recall of factual matter. But with the newer and better type of objective items in use today built to measure the diverse objectives of education, we have no evidence that study habits used in preparation for these objective tests are different from those used in getting ready for an essay test. Students study to pass tests. If the tests stress the assessment of various educational objectives, these the students will prepare for regardless of the type of test to be taken.

9. Is the essay test item more life-like and realistic than the objective test item? This we have shown to be not true. If anything, the situations set up for objective test items are more similar to those encountered in daily living.

10. Do students prefer essay tests to objective tests? Inconclusive research has been carried on related to this question. Perhaps, the real issue here is whose essay tests, whose objective tests. It is the writer's opinion that students are more concerned with the quality and validity of the various test items that they have to answer than they are with the basic forms in which the items appear.

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[1] Downie, N. M. Fundamentals of Measurement: Techniques and Practices. New York: Oxford University Press, 1967.

★

# TYPES OF WRITTEN EXAMINATIONS

- ESSAY
- SHORT OPEN ANSWER QUESTIONS
- COMPLETION ITEMS
- TRUE-FALSE ITEMS
- MULTIPLE CHOICE QUESTIONS
    - one best response type
    - the multiple true false type
    - the matching type
    - the comparison type
    - with diagrams, photographs etc. . .
    - in relation to taxonomic level
    - programmed test, patient management problem

★

## The use of the "essay question"

The following procedure is preferable:

- Use "essay questions" only to evaluate a type of achievement which cannot be measured just as efficiently by other methods (synthesis of a group of complex concepts, summary of a document, comparison of two phenomena, cause analysis, finding relationships, criticizing the relevance of a concept, formulating a plan of action).
- Limit the problem posed so that it is clearly apparent to the candidate and define the structure of the answer.
- Employ terms that are as explicit as possible, such as 'summarize", or "compare", "evaluate", "define", "arrange in order", etc. rather than "discuss" or "state everything you know", so that all the candidates immediately know what they have to do.
- Choose problems which call for careful consideration but whose solution can be briefly set out in the time allowed.
- Allow no choice among the questions set.
- Mark papers anonymously.
- When two or more teachers correct the same test, they should agree on the scoring procedure before the test and correct the results separately.
- For every question, set out yourself the elements which, according to you, should appear in the answer (scoring procedure).
- Use a point system of scoring based upon those elements that are expected to appear in the answers.
- Try out the scoring procedure on a few papers. Preferably, have all the teachers then read all the answers to a given question; or, if need be, have one of them read all the answers to a particular question in all the papers, have another teacher do the same for another question, and so on.
- Score the answers of all the students to one question before going on to the scoring of another question.
- Do not form a judgement of a candidate on the basis of only one question but calculate for each candidate a summative score based on the reading of several different essays, since such scores are more reliable than the score for any one essay taken separately.

## Use of short, open answer questions

This involves "series of questions drafted in such a way that the answer calls for a predetermined and precise concept". As their name indicates, the answer expected is short and can be "expressed in different forms" (open). "Ideally, only one answer is acceptable no matter in what terms it is exposed". The author of the question must "define in advance" (and in cooperation with colleagues) the answer called for by the wording of the question. If it appears that conceptually different answers will do for a given question then it should be reworded until that drawback disappears.

Correction is simple since the answer has been predetermined; pagination should allow the necessary space for the answer below each question.

Moreover, all the rules concerning essay tests apply.

NOW . . . .

check whether you have applied the principles explained on pages 412-415 and 418; prepare one essay type question and three "short open answer questions". In all cases it should be an "open book test".[1] Indicate the answer(s) called for in each case in order to obtain an objective scoring (identical score given by independent scorers).

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[1] "Open book test" means that candidates may use any book, document, personal notes; this implies that the question must evaluate a level higher than recall (see taxonomy, page 151 et seq.).

## DIRECTIONS FOR WRITING RECALL AND COMPLETION ITEMS[1]

1. Omit only key words and only one or two of these. Completion items can reach such absurdities as:

   . . . . . . . . . . . causes . . . . . . . . . . . . and . . . . . . . .

   Only the writer of the question knows the correct answer!

2. Repeat blank or blanks at the end of the statement. This is simply a matter of efficiency. When so placed, the student can complete the statement on finishing the reading. If the blanks appear at the beginning of the statement, he has to read to the end, go back to the beginning, and sometimes go through the entire statement again.

3. Try to have items that have only one correct response. This is often impossible and leads to the major problem in the use of completion items - the subjectivity of grading. Such considerations as the following arise: Are all synonyms to be considered in grading? Are all synonyms equally acceptable?

4. Finally, follow here many of the other rules discussed for true-false items - that is, don't lift items directly from the text: be brief, be clear; use quantitative terms if possible, etc.

## EXAMPLES OF COMPLETION ITEMS

| | ANSWERS |
|---|---|
| - SACCHAROSE IS COMPOSED OF . . . . . . . . | . . . . . . . . . . . . . . |
| MOLECULES OF . . . . . . . AND . . . . . | . . . . . . . / . . . . . . . |
| MOLECULES OF . . . . . . . . . | . . . . . . . . . . . . . . |
| - . . . . . . . . IS THE AUTHOR OF | . . . . . . . . . . . . . . |
| "INTRODUCTION TO THE STUDY OF EXPERIMENTAL MEDICINE", | |
| PUBLISHED IN THE YEAR . . . . . | . . . . . . . . . . . . . . |

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[1] Downie, N. M. Fundamentals of Measurement: Techniques and Practices. New York: Oxford University Press, 1967.

NOW . . . . . . . practise drawing up six completion items in your own field:

1. . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . .

2. . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . .

3. . . . . . . . . . . . . . . . . . . . . . . . . . . .

. . . . . . . . . . . . . . . . . . . . . . . . . . .

4. . . . . . . . . . . . . . . . . . . . . . . . . . . .

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5. . . . . . . . . . . . . . . . . . . . . . . . . . . .

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6. . . . . . . . . . . . . . . . . . . . . . . . . . . .

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## DIRECTIONS FOR WRITING TRUE-FALSE ITEMS[1]

1. Write each item so that it contains only one idea. Confusion results when two or more ideas, some true, some false, appear in the same item.

2. Do not lift items directly from the text. Sometimes slight changes such as inserting a not are made. This in no way improves the item. Items should at least be stated in a fashion in which the examinee has not seen them before.

3. Take great care to avoid the use of certain words that make it possible for the student to respond correctly to the item even when he knows nothing about the material. The word always calls for a "false" response, sometimes or usually a "true" response, never a false response, etc. If the test-writer is careful to distribute words of this nature equally among true and false items, this problem is eliminated. Another factor to be considered here is the length of the item. Unless the item-writer is careful, long involved statements will tend to be true. A wise student will soon become aware of this and mark long items "true" even when he knows nothing about the subject.

4. Be certain that the language is exact and expressed in numerical terms when necessary . . . usually we don't know the frame of reference from which an individual responds to qualitative words. Such words as large and small, many and few, more and less have no place in true-false items.

5. Don't emphasize the trivial. If the type of examination has anything to do with the type of learning that takes place - and it does - this is one way to encourage rather useless learning.

6. Avoid parenthetical phrases or clauses that have little to do with the central idea of the item.

7. Avoid negative statements. After an examinee has read several nots and nevers in a series of clauses, he becomes confused. He has heard that two negatives make a positive, so he tries to evaluate the statement from this point of view and then to decide whether it is true or false.

8. Have, in the long run, an equal number of true and false statements. These should be arranged so that there is no particular pattern of response.

9. Attribute to someone statements that reflect attitudes, basic philosophies, schools of thought, etc., otherwise there is no scorable answer.

10. An important inconvenience of this type of question is that the correct answer can be found by chance 50% of the time.

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[1] [illegible]nie, N. M. Fundamentals of Measurement: Techniques and Practices. New York: Oxford University Press, 1967.

## EXAMPLES OF TRUE OR FALSE ITEMS

| | | |
|---|---|---|
| - ENZYME MOLECULES CONTAIN NATRIUM | TRUE | FALSE |
| - THE PROXIMAL PART OF THE POSTERIOR BRANCH OF THE RADIAL NERVE TURNS AROUND THE NECK OF THE RADIUS | TRUE | FALSE |
| - NYSTAGMUS IS OBSERVED IN TABLES | TRUE | FALSE |

NOW . . . . . practise drawing up six questions of the

"TRUE-FALSE TYPE"

in your own field

| | T | F |
|---|---|---|
| 1. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .<br>. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | ☐ | ☐ |
| 2. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .<br>. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | ☐ | ☐ |
| 3. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .<br>. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | ☐ | ☐ |
| 4. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .<br>. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | ☐ | ☐ |
| 5. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .<br>. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | ☐ | ☐ |
| 6. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .<br>. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | ☐ | ☐ |

★

## DIRECTIONS FOR WRITING MULTIPLE-CHOICE QUESTIONS

1. Make certain that the stem consists of a statement or an idea, not just a single word.

2. Place all common elements in the stem of the item. This adds simplicity and compactness to the item.

3. Make each item completely independent of answers to other items.

4. Eliminate all unrelated details from an item.

5. In general, avoid negative statements, but if the word "NOT" does appear in the stem of the question, underline it to draw the student's attention to it.

6. Use plausible logical distractors. Each distractor should, by its content or nature, be such that it appears to have something to do with the question. Unrelated distractors appear silly to a thoughtful examinee. As the number of possible answers is cut down, the item loses some of its value.

7. Avoid the use of clues that may suggest the correct answer.

8. Be sure that the distractors and the correct response possess homogeneity, that is, they should be fairly similar in content or in the total number of words.

9. Be careful of the use of "none of the above" as a distractor or as a correct answer.

10. If it is impossible to obtain more than three plausible responses, don't waste time trying to invent some others.

11. When dealing with items that have numerical answers, arrange the answers in order from large to small or vice-versa.

12. Arrange the place for the correct answer in such a way that, for the test as a whole, no letter corresponding to a given answer appears more frequently than some other letter.

## TEST ITEM CHECK LIST[1]

It should be possible to answer "yes" to each of the following questions about a test item:

### 1. In general

1.1 Is the item as a whole realistic and practical?

1.2 Does it deal with an important and useful aspect of the profession?

1.3 Is it phrased in the working language of the profession?

1.4 Does it call for professional knowledge?

1.5 Is it independent of every other item in the test?

1.6 Is it specific?

1.7 Does it avoid the fault of giving away the best response by irrelevant details or extraneous data?

### 2. The essential problem

2.1 Is it clear?

2.2 Is it stated accurately?

2.3 Is it stated briefly but completely?

2.4 Does it contain only material relevant to its solution?

### 3. The distractors

3.1 Are the distractors important, plausible answers rather than obvious distractors?

3.2 Do they deal with similar ideas or data expressed in similar form?

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[1] Adkins, D. C., Construction and Analysis of Achievement Tests, Washington D.C., US Government Printing Office, 1947.

## EXAMPLES OF MULTIPLE CHOICE QUESTIONS

### One "best response" type

### Question 1

In differentiating cirrhosis of the liver from chronic constrictive pericarditis, a useful physical sign is:

A) hepatomegaly;

B) ascites;

C) distention of the neck veins;

D) pitting oedema of the ankles and legs;

E) splenomegaly.

### Question 2

Active immunization is available against all of the following diseases EXCEPT:

A) tuberculosis;

B) smallpox;

C) poliomyelitis;

D) malaria

E) yellow fever.

### The multiple-true-false type (also called "multiple-response item")

This type consists of a stem followed by several true or false statements. The candidate is to determine whether or not each of the four statements which follows is true or false. He then responds according to a code which permits one out of five possible combinations or responses whereby one, two, three, or all four statements may be true.

- when properly written, the multiple-true-false item type tests the student's knowledge or understanding of several related aspects of a substance, a disease, or a process;
- each of the statements or completions offered as possibilities must be clearly true or false. This is in contrast to the type "a" format in which alternatives which are "partially correct" may be used as distractors;
- this type of item should be written so that no two of the alternatives are mutually exclusive, i.e. the answer "all are correct" must be a possible response.

The directions for this item type are as follows:

For each of the incomplete statements below, ONE or MORE of the completions is correct. On the answer sheet blacken space under:

A) if only 1, 2 and 3 are correct;

B) if only 1 and 3 are correct;

C) if only 2 and 4 are correct;

D) if only 4 is correct;

E) if all are correct.

### Question 3

A child suffering from an acute exacerbation of rheumatic fever usually has:

1) an elevated sedimentation rate;

2) a prolonged P - R interval;

3) an elevated antistreptolysin O titre;

4) subcutaneous nodules.

## The matching type

### Directions for constructing matching items[1]

- Limit the number of entries to about 10. If situations arise where 20 or 30 entries must be considered, construct two or three matching items. When long lists have to be matched, the student wastes too much time in trying to find the correct response.

- Do not break items by the bottom of the page. The complete item should be on the same page.

- Have a longer list of questions than of possible answers and state in the directions that these may be used more than once. When there are an equal number of questions and answers, it is possible for the student, after responding to some of them, to complete his task by elimination and guessing.

- Strive for homogeneity.

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[1] Downie, N. M. Fundamentals of Measurement: Techniques and Practices, New York, Oxford University Press, 1967.

The directions given to examinees for this type of item are as follows:

"Each group of questions below consists of lettered headings followed by a list of numbered words or statements. For each numbered word or statement, select the one heading that is most closely associated with it and blacken the corresponding space on the answer sheet. Each lettered heading may be selected once, more than once, or not at all.

Examples: Questions 4 to 9

A) increased metabolic activity;
B) hyperinsulinism;
C) lack of storage of glycogen in the liver;
D) storage of an abnormal glycogen in the liver;
E) decreased secretion by pituitary or adrenal glands;
  4) adenoma of islets of Langerhans;
  5) violent exercise;
  6) hyperthyroidism;
  7) Simmond's disease;
  8) Von Gierke's disease;
  9) epidemic hepatitis;

Questions 10 to 14

A) sodium bicarbonate;
B) sodium carboxymethylcellulose;
C) aluminium hydroxide gel;
D) none of the above;
  10) a gastric antacid which is also used in the therapy of hypoparathyproidism because of its property of reducing the absorption of phosphorus;
  11) because it is absorbed, it may cause alkalosis, particularly in infants and elderly patients;
  12) a gastric antacid which has the disadvantage of causing "acid-rebound";
  13) a gastric antacid which precipitates and inactivates gastric pepsin;
  14) a gastric antacid and demulcent which can be converted to liver glycogen.

### The comparison type

The "comparison" type permits one to compare and contrast two diseases, signs, symptoms, laboratory findings, etc.

When using this type of item, one must be careful to: (1) avoid the trivial; (2) avoid selecting as one of the pair something that is rare or unusual. For example, if the item asks about the relation of a certain symptom to disease "x" or "y", and the frequency of the symptom in the two diseases is 90% and less than 1% respectively, then the examinee is in a dilemma. If he follows the principle of the "general rule", he may select answer A ("x" only); but if he is aware that the symptom does occur in the exceptional case of disease "y", then he may select answer C ("both"). Which response is correct?

The instructions for this type of item are as follows:

"Each set of lettered headings below is followed by a list of numbered words or phrases. For each numbered word or phrase, blacken the space on the answer sheet under:

A) if the item is associated with (A) only;

B) if the item is associated with (B) only;

C) if the item is associated with both (A) and (B);

D) if the item is associated with neither (A) nor (B).

**Examples:** Questions 15 to 17

A) hookworm disease;

B) ascariasis;

C) both;

D) neither;

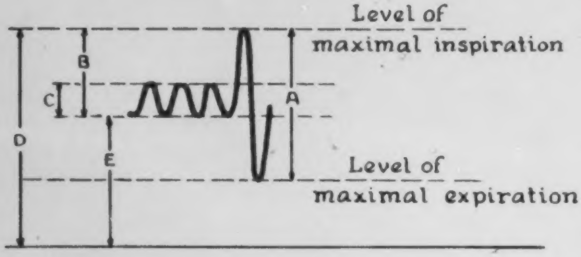
15) eosinophilia;

16) hypochromic anaemia;

17) infection through the skin.

Questions with diagrams, photographs, etc.

Questions 18 to 20



| | |
|---|---|
| Question 18 | Total lung capacity |
| Question 19 | Inspiratory capacity |
| Question 20 | Vital capacity |

NOW . . . . .

Practise drawing up four multiple choice questions in the cognitive field using the principles just defined (pages 428 to 433). At least three of them should measure an intellectual process above level one "simple recall" (they should be on level two "interpretation of data" or level three "problem solving"). For this purpose use the objectives you have drawn up on page 165.

QUESTION 1.

QUESTION 2.

QUESTION 3.

QUESTION 4.

Now refer to pages 428 and 429 and see whether your questions comply with the principles advocated. You can also consult the following examples (pages 437 and 440).

## EXAMPLE OF ITEMS CONSTRUCTED IN ACCORDANCE WITH THE TAXONOMIC LEVEL

(cognitive domain - see pages 152-155)

**Utilization of clinical tests for application of basic science concepts.**

### ★ LEVEL 1 - Recall of facts

**Item 1** : The Fick principle is illustrated mathematically by which of the following formulae:

A. $$\frac{A_{O_2} - V_{O_2}}{O_2 \text{ Consumption (ml/min)}}$$

B. $$\frac{\text{Cardiac Output (litres/min)}}{\text{Heart Rate (beats/min)}}$$

C. $$\frac{\text{Heart Rate (beats/min)}}{\text{Cardiac Output (litres/min)}}$$

D. $$\frac{O_2 \text{ Consumption (ml/min)}}{A_{O_2} - V_{O_2}}$$

E. $$\frac{\text{Cardiac Output (litres/min)}}{\text{Body Surface Area (sq. metres)}}$$

### ★ LEVEL 2 - Interpretation of specific data

**Item 2** : Apply the Fick principle to the following data and calculate the amount of glucose (in mg/min) extracted by the spleen of a dog:

Cardiac output - 2 litres/min

Stroke volume - 200 ml/min

Cardiac index - 2.8 litres/sq. metre

Arterial glucose - 100 mg/ml

Splenic vein glucose - 96 mg/ml

Splenic blood flow - 50 ml/min

Which of the following corresponds to the result of your calculations?:

A) 140 B) 178 C) 200 D) 225 E) 250

LEVEL 2 - Interpretation of specific data (continued)

Clinical case (for questions 3, 4 and 5)

A 25 year old male patient comes to your office complaining of cramps in the muscles of his arms or legs whenever he engages in strenuous muscular exercise. This complaint has become more prominent over the past three to four years. The general physical examination is normal. The patient has previously been seen by another doctor who performed a muscle biopsy. When you call the other doctor's office, you learn that the only abnormality noted on the biopsy was excess accumulation of glycogen in the muscle fibres. Electromyography was normal.

The blood chemistry determinations related to carbohydrate metabolism which are performed in the hospital where you work are glucose and lactate.

You decide that you want to find out why the patient has muscle cramps and excess glycogen. To obtain further data, you apply the Fick principle to the right leg and insert small polyethylene catheters in the femoral artery and femoral vein at the level of the inguinal ligament. You make a blood flow estimation for the right leg and obtain a value of 200 ml/min at rest. You also take two resting blood samples from the arterial and venous catheters.

You then have your patient pump a bicycle ergometer for five minutes and at the end of exercise you take a series of five arterial and venous samples at two minute intervals. You have glucose and lactate determinations performed on each of the 14 blood samples. The results on the resting samples are reported as follows:

| | Arterial | Venous |
|---|---|---|
| Glucose | 75 mg % | 73 mg % |
| Lactate | 8 mg % | 9 mg % |

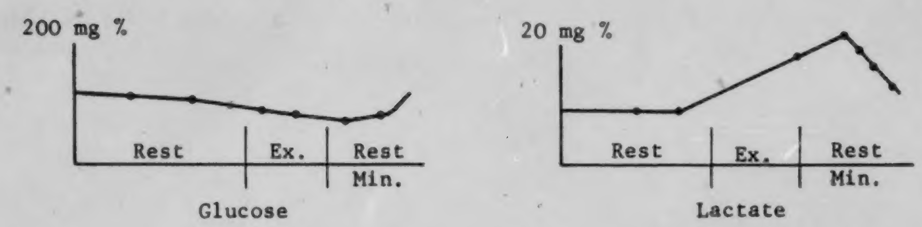
Item 3 : The glucose and lactate extraction (in mg/min) by the tissues of the right leg in the resting state is:

| | A | B | C | D | E |
|---|---|---|---|---|---|
| Glucose | 400 | 4 | 100 | 0.01 | 40 |
| Lactate | 200 | 2 | 200 | 0.005 | 20 |

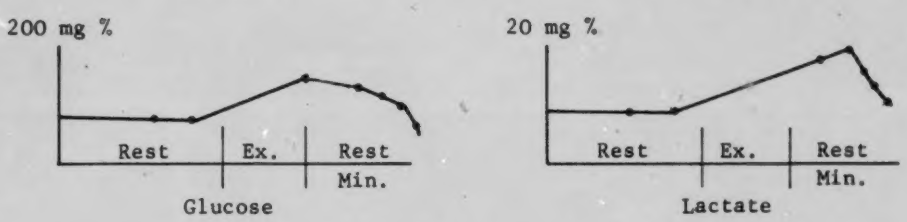
★ LEVEL 3 - Solution of a problem

Item 4 : On the basis of your knowledge of muscle carbohydrate metabolism, the history from the patient and the muscle biopsy report, which of the following sets of pre-post exercise data on venous blood would be most likely in this patient?

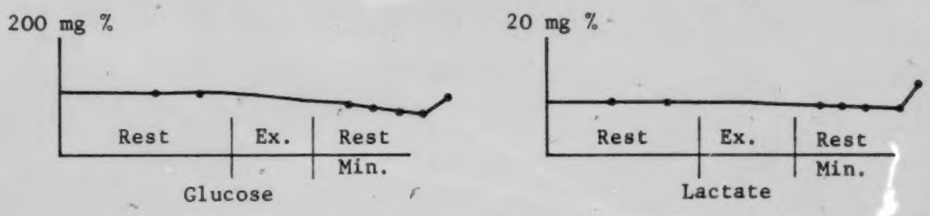
A.



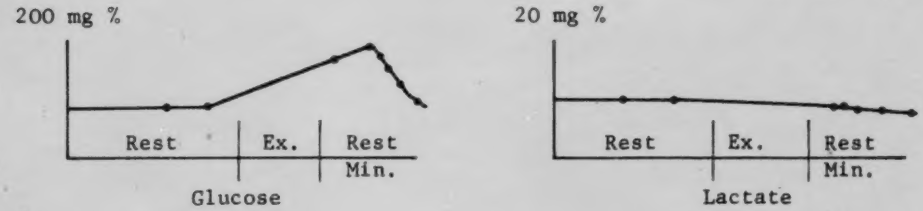
B.



C.



D.

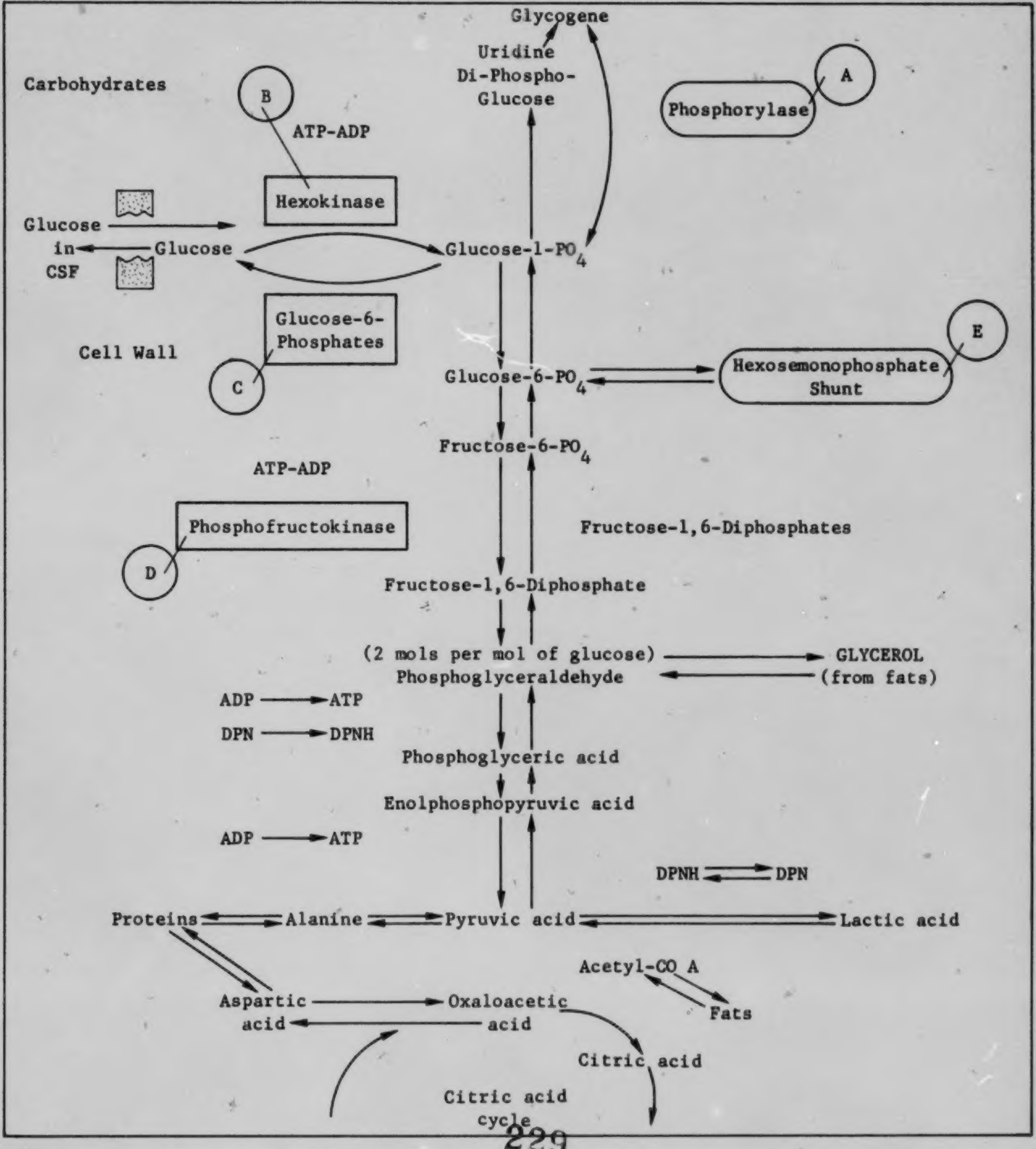


## ★ LEVEL 3 - Solution of a problem (continued)

**Item 5** : Study the basic principles of carbohydrate metabolism as shown in the figure below. Note those parts of the metabolic route indicated by a letter (A, B, C, D and E).

Assuming that one of several reasonable explanations of the symptoms presented by the patient is a metabolic block, and on the basis of the data available to you after study of the preceding parts of the question, select the letter which would be the most probable site in this route of metabolic block in the patient.

Mark on the answer sheet the letter identifying the point in the route where a more thorough study would have most chance of giving positive results.


Glycogene
Uridine
Di-Phospho-
Glucose
Carbohydrates
B
ATP-ADP
Hexokinase
A
Phosphorylase
Glucose
in
CSF
Glucose
Glucose-1-PO4
Glucose-6-
Phosphates
Cell Wall
C
Glucose-6-PO4
E
Hexosemonophosphate
Shunt
Fructose-6-PO4
ATP-ADP
Phosphofructokinase
D
Fructose-1,6-Diphosphates
Fructose-1,6-Diphosphate
(2 mols per mol of glucose)
Phosphoglyceraldehyde
GLYCEROL
(from fats)
ADP → ATP
DPN → DPNH
Phosphoglyceric acid
Enolphosphopyruvic acid
ADP → ATP
DPNH ⇄ DPN
Proteins
Alanine
Pyruvic acid
Lactic acid
Acetyl-CO A
Fats
Aspartic
acid
Oxaloacetic
acid
Citric acid
Citric acid
cycle

## THE PROGRAMMED EXAMINATION[1]

The advantages of this relatively recent method (it appeared at the beginning of the 1960s) are so great that they should help in overcoming the difficulties attaching to its use.

Briefly, its aim is to measure (by simulation on paper) the "clinical competence" of the physician.

Like the multiple choice questions it is highly objective and can be corrected by computer. Its name shows that this new examination method has certain aspects identical to those of programmed teaching, where the candidate advances, step by step, through a series of consecutive clinical problems.

The method was developed in the United States of America and several types of such simulation test can be found in the literature. They are sometimes referred to as Patient Management Problems (PMP), Clinical Simulations, etc.

### Objectives of the method

The aim of the method is to evaluate a physician's clinical competence:

- Can he detect and satisfactorily interpret abnormal signs and symptoms?
- Does he then reach a reasonable diagnosis? Is his judgement satisfactory in choice of treatment?

Until the early 1960s examiners tried to find an answer to these questions by confronting the candidate with a carefully selected patient. This method was effective in the past, when candidates were not very numerous. More recently, faced with thousands of candidates, thousands of patients and thousands of examiners test specialists confronted a difficulty which they rapidly recognized. There were three variables; the candidate, the patient and the examiner. This represented two variables too many for a valid evaluation of the candidate.

Research consisted in seeking a valid definition of the qualities involved in what is termed clinical competence (at the level, for example, of a hospital intern). One method employed was that of the questionnaire using Flanagan's "critical incident" technique (see p. 111).

Through direct interviews and questionnaires, several hundred physicians were asked to describe clinical situations during which they had personally observed interns in the course of their work and had been impressed on the one hand, by examples of satisfactory clinical conduct, and, on the other, by examples of unorthodox clinical conduct. Several thousand situations of this type were analysed. This ample documentation gave an idea of what had to be evaluated.

The following step was to determine how to evaluate this "what". Numerous methods were envisaged.

Silent films, in colour, of carefully selected patients were used instead of actual patients, the examiner being replaced by a series of multiple choice questions concerning the patient presented. This method proved satisfactory and it is now in routine use by examining bodies.

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[1] See also "Simulation in instruction and evaluation in Medicine" in WHO, Public Health Papers, No. 61.

Finally another method was found (programmed testing) for evaluating the abilities of the intern when placed in a clinical situation as real as possible and called upon to face the unforeseeable problems presented by every patient.

In everyday routine the intern may be required, for example, to see a patient who has just been admitted to the medical department. He goes to the patient, gets information from him and makes a clinical examination. He must then take a certain number of decisions. He calls for certain laboratory tests whose results, combined with those of the clinical examination, will lead him to reach a diagnosis and decide on a treatment. The patient's condition may then improve, worsen or remain unchanged by the treatment. The situation changes, new problems appear and fresh decisions must then be taken in the light of these new data.

PROGRAMMED TESTING recreates, as far as possible, the changing situation represented by every patient. Each patient is described in accordance with a real case history. From four to six "clinical problems" are presented following the case study with the aim of simulating a situation changing in time. The patient can be followed up for several days, weeks or possibly months, just as in real life, until he is discharged either cured or with his condition improved or, if he dies, passes to the autopsy table.

At each step in time the candidate is required to make decisions; he immediately learns the results thereof and, with this fresh information, goes on to the following "choice", always concerning the same patient.

## The "eraser" technique

The methodology of this type of test, as with programmed teaching, implies that the information given to the candidate is hidden from him until he has made a decision and thus becomes entitled to obtain additional information.

We shall not deal at length with the different technical difficulties that had to be overcome before a satisfactory system was found. As things are at present the appropriate information is hidden by a completely opaque layer of ink which can be removed, however, with an ordinary pencil eraser, or revealed by a system comparable to invisible ink.

The method can be easily used for examining a large number of candidates simultaneously.

## Examples of case histories

A clinical observation is described to the candidate and he is then asked:

1. To study the details carefully and then the list of possible decisions presented for each "choice" linked with the initial observation.
2. To choose from the list only the numbered items which seem important and appropriate.
3. To erase the corresponding opaque rectangle on the answer sheet.

The candidate is reminded:

1. That it is not suggested how many proposed decisions he should choose.
2. That information will appear in the space erased for both correct and incorrect choices.
3. That since the information gradually revealed may orientate his subsequent decisions he should consider them one after another in the order indicated.
4. But that within each "choice", the order of the numbered decisions is proposed at random although it is advisable for the candidate to re-establish a logical order in his choice.

## Scoring

The usual machine method of scoring is employed, each space erased corresponding to one response so that the candidate is unable to cancel a mistake once his choice has been made (the same applies in the case of a real patient).

The candidate is penalized whenever he makes an incorrect choice and whenever he fails to make a choice which was appropriate. The scoring is thus negative, taking into account sins of both omission and commission.

The choices proposed to candidates can be divided into three groups:

(a) Appropriate; should be made with the aim of improving the patient's condition;

(b) Not indicated; should not be done and, if it is done, may be dangerous for the patient;

(c) Neutral, of debatable importance; may or may not be done according to local conditions, teaching, customs, etc.

The candidate who does not make a choice regarded as suitable by the examiner or who makes a choice regarded as not indicated or dangerous is penalized.

Choice (c) has no effect on the scoring.

Consequently, this is a scoring system[1] completely different from the multiple choice question method, where the candidate must select the best (and only) answer from several suggested.

In programmed testing he must decide to select all those choices he regards as appropriate for the treatment of the patient. He is not told how many choices he must make. The same applies in medical practice, where the physician makes a choice between what should be done and what should not be done. If he is proceeding on the right lines, he makes a certain number of decisions out of all those which could be made.

Experience (immediate feedback after "erasing") gives him fresh data which will guide him towards new decisions.

If he is on the wrong track, experience ("erasing") will show him his errors as they arise and give him a chance of changing his action although he will be unable to cancel out his mistakes.

## IMPROVEMENT OF CASE HISTORIES

By means of docimological correlation studies the quality of questionnaires can be improved. The teachers who have drawn up the questions learn from the statistical study, question by question, how they can better test discriminatory qualities of judgement enabling a choice to be defined as "appropriate", "non-indicated", or "neutral".

The task is different and considerably more arduous than that involved in drawing up the usual multiple choice questions.

On the other hand, the examiners find themselves on more familiar ground and feel that they are dealing with practical clinical situations in a much more realistic way than when they had to decide on a single best choice.

The method is far from perfect and calls for constant improvement, but gives new hopes for the evaluation of the clinical competence of physicians. It makes possible the evaluation of certain qualities which were not evaluated in the past, qualities considered essential for preparing the physician to assume independent responsibility in the practice of his profession.

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[1] Other scoring systems have been described.

If you would like to try this exercise, cover up the right hand column giving the answers.

### OBSERVATION

I. A man 57 years of age and in good health until then is referred to the out-patient department because three days ago he suffered from anterior chest pains of two hours duration and, an hour previously a repeated, less violent pain lasting a quarter of an hour. On examination the patient is found to be in good general condition. He weighs 95 kg and measures 1.60 m in height. He is no longer in pain. The pulse rate is 90/min, and blood pressure 110/70 (usually 180/100). Lungs normal, peripheral pulses felt, liver extends one fingerbreadth below the costal margin, not tender, nothing abnormal discovered in lower limbs. Urinalysis on admission: sugar ++, acetone 0, albumin +. The patient is then hospitalized.

| ACTION TO BE TAKEN | ANSWERS | SCORE[1] |
|---|---|---|
| 1. Take an emergency electrocardiogram | 1. Sinus rhythm PR 0.22 Left bundle branch block and deviation upwards of ST in V1, V2, V3. | +1 |
| 2. Chest X-ray with patient in bed | 2. Normal heart volume. Aorta somewhat enlarged, lungs normal. | 0 |
| 3. Transaminases | 3. SGPT 15, SGOT 40 | +1 |
| 4. Emergency determination of urea, blood sugar, blood bicarbonate | 4. Urea 0.60 g, blood sugar 2 g/l, blood bicarbonate 23 mEq/l | +1 |
| 5. Anticoagulant therapy (intravenous drip heparin), oxygen therapy, monitoring of pulse and blood pressure | 5. An hour later the patient is well, the pulse rate is 80 and the blood pressure 130/80. | +1 |

---

[1] The scoring shown for this observation was decided on by clinicians who were kind enough to give their assistance and whom we should like to thank. Other clinicians might perhaps prefer different scoring or a different therapeutic approach. The purpose of the article is not to discuss this, but to make clear the general principles of the method.

| ACTION TO BE TAKEN | ANSWERS | SCORE |
|---|---|---|
| 6. Intravenous digitalin, sulfonamide diuretics | 6. Treatment cancelled by head of department | -1 |
| 7. Intravenous levophed | 7. Sudden rise in blood pressure to 250/140. Acute pulmonary oedema | -1 |

II. The next day, while he seems to be doing well, the patient loses consciousness during medical rounds without any warning pain or spasm. He is pale, blood pressure too low to measure, pulse imperceptible and heart sounds inaudible.

| ACTION TO BE TAKEN | ANSWERS | SCORE |
|---|---|---|
| 8. Intracardiac adrenalin | 8. Ineffective, death | -1 |
| 9 Intravenous ouabain | 9. Death | -1 |
| 10. 20 units intravenous insulin + 500 ml saline with bicarbonate by intravenous drip. | 10. Death | -1 |
| 11. Emergency electrocardiogram before undertaking any treatment | 11. P wave 70/mn. Rare ventricular complexes, the patient dies during the recording | -1 |
| 12. External heart massage with mouth-to-mouth respiration | 12. After 15 minutes the patient regains colour, pupils return to normal, the femoral pulses are easily perceptible, blood pressure 180, return to consciousness | +1 |
| 13. Intravenous procain amide | 13. Definitive heart arrest, death | -1 |
| 14. Solucamphor | 14. Ineffective, death | -1 |

III. An hour after the heart attack the patient is again normally conscious and seems to be in good condition. The heart rhythm is 40, blood pressure 150/60. The electrocardiogram shows a ventricular rhythm of 35/min with 70/min P waves independent of the ventricular complexes, the latter having the appearance of a left bundle branch block.

Respiration is normal, diuresis is 30 ml since loss of consciousness. The humoral balance is as follows: blood sugar, 2.20 g/l; bicarbonates, 15 mEq/l; ketone bodies, 0; sodium, 140 mEq/l; chloride, 100 mEq/l; potassium, 5.4 mEq/l.

| ACTION TO BE TAKEN | ANSWERS | SCORE |
|---|---|---|
| 15. 250 ml of molar sodium lactate solution administered by intravenous drip at the rate of 80 drops per minute | 15. Increase of heart rhythm to 80, followed by further syncope, ventricular fibrillation, and death | -1 |
| 16. Isopropylnoradrenalin, 1 mg every two hours | 16. Increase in heart rhythm to 55 per minute. No syncope during eight days | +1 |
| 17. No treatment, patient kept under surveillance | 17. Repeated syncope leading to syncopal status. Collapse, arrest of respiration. Death | -1 |
| 18. Emergency introduction of an incorporated pacemaker | 18. Cerebral embolism when recovering from the operation three days later | -1 |
| 19. 500 ml of 14% bicarbonated saline | 19. 12 hours later, alkaline reserve 23 mEq/l | -1 |
| 20. Insulin, 48 intravenous units to be repeated depending on glycosuria | 20. Hypoglycaemic coma | -1 |
| 21. 500 ml of 10% mannitol administered over 12 hours | 21. Diuresis during the 24 hours following the commencement of intravenous drip 1500 ml | 0 |

IV. After a week the heart rhythm is stable and regular at 70/min. The electrocardiogram shows a complete left bundle branch block, the patient is in good condition, weight 83 kg; blood pressure 140/90; glucosuria +; fasting blood sugar 1.30 g; blood sugar an hour-and-a-half after midday meal, 1.90 g; urea clearance 45 ml/min; albuminuria, 1 g per 24 hours; acetonuria, 0.

| ACTION TO BE TAKEN | ANSWERS | SCORE |
|---|---|---|
| 22. Patient authorized to get up and sent home for a fortnight's convalescence | 22. Three months later, dies suddenly in the street; post-mortem: ruptured dilatation of left ventricular wall. | -1 |
| 23. Kept in bed for another three weeks, continuing anticoagulant treatment with vitamin K antagonists | 23. Favourable course | +1 |
| 24. 1200 calorie diet | 24. Well tolerated, disappearance of glycosuria | +1 |
| 25. Restricted carbohydrate diet with hypoglycaemic sulfonamides | 25. The patient has gained 2 kg after three weeks | 0 |
| 26. Diet with 250 g of glucides as well as 20 units per day of protamine zinc insulin | 26. Numerous hypoglycaemic episodes; during one of them, stroke with some cerebral softening | -1 |

V. A month after the onset of the illness, during convalescence, fever of 38-38.5°C, appears, chest pains radiating into the shoulder and left arm unassociated with effort. Regular heart rate of 75, systolic and diastolic rubbing sound on auscultation. No pain in the lower limbs. Slight dullness on percussion of left base.

| ACTION TO BE TAKEN | ANSWERS | SCORE |
|---|---|---|
| 27. Repeat electrocardiogram | 27. Left bundle branch block, PR 0.16 seconds, deviation upwards of ST in the precordial leads | +1 |
| 28. Chest X-ray | 28. Left pleural effusion | +1 |
| 29. Transaminases and sedimentation rate | 29. SGOT 10, SGPT 16, Sed. Rate 60, 100, 120 | +1 |
| 30. Patient again ordered complete bed rest for a month without any other treatment | 30. Increased sedimentation rate and pain persists for three months | -1 |
| 31. Reinforce anticoagulant treatment by intravenous heparin | 31. Pericardial effusion with tamponade | -1 |
| 32. Corticoid therapy, 30 mg per day for eight days with aspirin as replacement and monitoring of glycosuria | 32. Disappearance of fever and pains in a few days as well as of pleural effusion and rubbing sound | +1 |
| 33. Pleural puncture | 33. Sero-fibrinous exudate obtained. On following day, extensive haemothorax and shock | -1 |

VI. The patient has recovered and is convalescing. He now has to be given long-term advice concerning general behaviour, diet and medication.

| ACTION TO BE TAKEN | ANSWERS | SCORE |
|---|---|---|
| 34. Complete cessation of occupational activities for a very long period | 34. Development of a depressive syndrome with general feeling of ill-health and anxiety | -1 |
| 35. Strict salt-free diet with long-term administration of diuretics. Administration of digitalin at intervals: 10 drops, four days a week | 35. Vomiting and dehydration symptoms owing to lack of salt, hypokalaemia with varying ventricular extrasystoles | -1 |
| 36. Maintenance of anticoagulant treatment for a lengthy period with fortnightly monitoring of prothrombin level. Normal occupational activities at the end of the second month. Prohibition of tobacco. Continuance of diet previously prescribed | 36. Regular outpatient visits; patient getting on well, works full-time, no glycosuria, has lost several kg in a month | +1 |

* * *

## DESIRABLE QUALITIES OF RATING SCALES

- Clarity
- Relevance
- Precision
- Variety
- Objectivity
- Uniqueness

★

## ERRORS TO BE AVOIDED IN RATING SCALE CONSTRUCTION AND USE

Errors of leniency

Error of central tendency

Halo effect

Logical error

Contrast error

Proximity error

★

## Factors influencing rating[1]

It is supposed that a human observer is able to carry out a more or less objective evaluation, and it is known that such evaluations are subject to error.

→ Leniency is a well-known factor. One means of counterbalancing this tendency is to propose a scale which comprises only one "unfavourable" appraisal in five, for instance:

Poor — Average — Good — Very Good — Excellent

→ In this case, the appraisals will probably be distributed symmetrically around "good".

Examiners have a tendency not to give extreme appraisals and hence to group all candidates around the mean. This central tendency may be reduced by using a scale which is wider at the centre than at the ends, for example:

-7 -6 -4 0 +4 +6 +7

→ A particular feature of a candidate sometimes seems so important to the examiner that it influences the overall evaluation. Thorndike called this the Halo Effect. However, this effect is reduced as the number of separate aspects of the problem dealt with by the evaluation is increased.

→ The "Logical" error is similar to the halo effect and it occurs when the examiner supposes that there is a relationship between two variables to be evaluated and that "if the first variable is of a particular order, the second will be similar". This error may be reduced if the evaluation relates to an observable element rather than to an abstraction, which could lead to semantic confusion.

→ An observer who is very orderly will have a tendency to consider, by contrast, that other people are less orderly than he is, and vice versa. On the other hand, people frequently believe that "others are like me" and are very surprised to see that this is not so.

→ If an observer evaluates two different factors, the evaluation of the one factor has a tendency to influence that of the other, and the shorter the interval between the two evaluations, the more pronounced the tendency will be (proximity error).

→ This list of human factors influencing evaluation is not restrictive but those mentioned are the ones best known.

★

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[1] Guilford, Psychometric Methods, pages 278-280.

## TEST CONSTRUCTION SPECIFICATION TABLE*

| CONTENT | PROCESS | | | | |
|---|---|---|---|---|---|
| | Recall of facts | Interpretation of data | Problem Solving | % | n |
| OBJECTIVE 1 | 6 | 3 | 1 | 20 | 10 |
| OBJECTIVE 2 | 8 | 2 | 0 | 20 | 10 |
| | 12 | 6 | 2 | 40 | 20 |
| OBJECTIVE "n" | 4 | 4 | 2 | 20 | 10 |
| No. of items | 30 | 15 | 5 | | 50 |
| % | 60 | 30 | 10 | 100 | |

As an exercise, fill in a specification table for the last examination you were responsible for →

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* see p. 253-254

## TEST CONSTRUCTION SPECIFICATION TABLE

| CONTENT | PROCESS | | | | |
|---|---|---|---|---|---|
| | Recall of facts | Interpretation of data | Problem Solving | % | n |
| OBJECTIVE 1 | | | | | |
| OBJECTIVE 2 | | | | | |
| | | | | | |
| OBJECTIVE "n" | | | | | |
| No. of items | | | | | |
| % | | | | 100 | |

## RELATIVE and ABSOLUTE criteria tests

These two expressions are also referred to in the literature under norm-referenced and criterion-referenced tests.

It is very important to distinguish between tests based on reference to the "norm" (i.e. in accordance with the curve for the results of all the students who have taken the same test, and that is why this criterion is termed RELATIVE), and tests based on reference to a "criterion" (i.e., in relation to the description of an acceptable performance namely the specific educational objective fixed in advance).

Norm-referenced tests are the ones most frequently employed. Unfortunately their disadvantages greatly outnumber their advantages, for if a group of students is particularly brilliant the utilization of relative criteria tests will lead to some of them being failed although their level of performance may be satisfactory from the absolute viewpoint. On the other hand, if a given group of students has on the whole a low performance level (because the appropriate instruction has not been given, or has been poorly given, or for some other reason) the relative criteria system may enable "poor" students to pass if they are above the average of their group.

If it is felt unanimously by an evaluation committee, for example, that all the students should be able to master an emergency procedure, then this can be ascertained by an absolute criteria test.

A measuring technique adapted to absolute criteria tests is suggested on pages 458-460, namely calculation of the Minimum Pass Level (MPL).

You will find on pages 465-473 the measuring techniques suitable for relative criteria tests (difficulty and discrimination indices).

# Calculation of the Minimum Pass Level for a MCQ test

## 1. DEFINITION

The Minimum Pass Level (MPL) is a threshold value making it possible to decide (according to absolute criteria) whether a student "who knows barely enough" should be passed or failed.

> Calculation of the MPL for a test is not valid unless the number of MCQ is more than 30.
>
> Use of the MPL involves an ADVANCE judgement (before the test) on the relative difficulty of each question and enables a judgement based on the test as a whole to be made.
>
> Calculation of the MPL depends on the collective decision of several teachers each of whom has first made an independent judgement.

## 2. PROCEDURE[1]

To calculate the Minimum Pass Level (MPL) of a student for a MCQ test:

2.1 the evaluation board decides what is the correct answer to each MCQ;

2.2 the board decides which answer or answers must definitely be eliminated by the student, other than by chance;

2.3 the board calculates the acceptability index for each MCQ;

2.4 the MPL for the test is the sum of the acceptability indices for each MCQ.

The acceptability index for a MCQ is calculated as follows:

Carefully study all the choices offered (distractors) and decide which the student "who knows barely enough to pass" should be able to reject. For example, if a question offers five choices (only one of which is the correct answer) and it is deemed that the student "who knows barely enough to pass" should be able to reject one of these choices straightaway, it follows that the marginal student could obtain the correct answer by mere chance approximately one time out of four. In this case the acceptability index of the question is 0.25.

Thus, for a 5 choice MCQ:

- if all the distractors are equivalent, the index = $1/5 = 0.20$
- if one distractor must be eliminated, the index = $1/4 = 0.25$
- if two distractors must be eliminated, the index = $1/3 = 0.33$
- if three distractors must be eliminated, the index = $1/2 = 0.50$
- if four distractors must be eliminated, the index = $1/1 = 1.00$

---

[1] The procedure described was devised on the basis of an article by L. Nedelsky (absolute grading standards for objective tests. Educ. Psycholog. Meas., 14: 3-19, 1954).

Let us take two MCQ which are worded identically but where the choice of answers is different.

Question: Which of the following values corresponds to the number of red cells per mm$^3$ of blood in a healthy adult?

| | 1 | | 2 |
|---|---|---|---|
| A | 500 000 | A | 4 000 000 |
| B | 1 000 000 | B | 4 500 000 |
| C | 2 000 000 | C | 4 750 000 |
| D | 3 000 000 | D | 5 000 000 |
| E | 5 000 000 | E | 5 250 000 |

In case 1, an acceptability index of 1.00 could be considered while in case 2 it could be 0.25.

## 3. COMMENTS

The MPL has little value if it is not based on a detailed analysis of each of the questions in a test, including consideration of incorrect choices just as much as of correct answers.

The validity of the estimate of the MPL also depends on obtaining independent judgements from several teachers who have paid careful attention to the educational objectives and the level for which the examination is intended. The usefulness of the estimate will be the greater the larger the number of teachers involved.

When the differences between the judgements obtained are relatively small, the extremes can serve for defining a "grey zone" below which the results will be regarded as distinctly inadequate (failure) and above which the results will clearly indicate a success. For example, if the mean of the estimates of one teacher for the MPL of a test is 43% whereas two other teachers obtain figures of 45% and 47%, respectively, then it could be recommended that any score below 43% should be regarded as a failure, that any score above 47% be regarded as a success, while a score between 43% and 47% should be regarded as being in a grey zone. It would remain to be defined what should be done in the latter case.

If the differences between the judgements obtained by several teachers are large then the criteria of the educational objectives should be revised.

Now . . calculate the MPL for all the MCQ you drew up on page 435.

## SIGNIFICANCE AND FORM OF COMMUNICATION OF THE RESULTS OF A TEST AS A WHOLE

| | RELATIVE CRITERIA TESTS | ABSOLUTE CRITERIA TESTS |
|---|---|---|
| BASE | DISTRIBUTION OF THE RESULTS | EDUCATIONAL OBJECTIVES |
| PASS SCORE | A POSTERIORI | A PRIORI |
| FORM OF RESULTS | * SCORING<br>– ALPHABETICAL<br>– NUMERICAL | * SCORING<br>– ALPHABETICAL<br>– NUMERICAL<br>* DESCRIPTIVE PROFILE OF STUDENT |

## STATISTICAL CONSIDERATIONS[1]

### HOW TO MAKE SURE THAT THE RESULTS HAVE A CERTAIN DEGREE OF VALIDITY

Content validity is essentially a matter of judgement. Every question should be carefully reviewed, together with colleagues, in relation to the corresponding educational objectives, to see whether it really measures the objectives chosen.

Predictive validity is a validation based on the existence of a criterion, of an element of comparison which must be correlated with the results obtained. Often there are no criteria and in this case validity becomes dubious. However, the customary procedure is to make use of statistics to obtain a linear correlation coefficient between the results of the criterion and the results of the test. This coefficient can also be derived either from the scores obtained (using the Bravais-Pearson coefficient "r") or from a ranking classification of the students (using Spearman's coefficient "rho"). In both cases you should refer to a book on statistics if you wish to know the formula.

### HOW TO MAKE SURE THAT THE RESULTS HAVE A CERTAIN DEGREE OF RELIABILITY

To estimate the degree of reliability of the results of a test two series measurement must be made under identical conditions and the results then compared. As it is practically impossible to work under rigorously identical conditions, various methods are employed.

#### Estimation by correlation methods

Test-retest method: this makes it possible to measure the stability either of the procedure for administering the test or of the students; those who have obtained the best marks during the test obtain the best mark in the retest. Only the time factor is involved in decreasing the reliability coefficient. The procedure is as follows:

(a) Administer the same test twice to the same group of students after a time interval which can vary from a few minutes to several years.

(b) Calculate the correlation coefficient (r or rho).

Method of equivalent forms: this measures the uniformity with which two forms of the same test, supposed to be equivalent, measure the same behaviours of the student.

Test-retest method with equivalent forms: this measures both the stability and the equivalence of two forms of one and the same test.

The procedure is as follows:

(a) Administer two equivalent forms of the same test to the same group with a given time interval.

(b) Calculate the correlation coefficient (r or rho).

---

→ [1] If you are allergic to mathematical formulae, pass on directly to page 465.

*Split-half method*: this makes it possible to measure the homogeneity and the internal consistency of the test.

The procedure is as follows:

(a) Administer the whole test to the same group.

(b) Divide the administered and corrected test into two halves:

- either by random sampling
- or by upper half and lower half
- or by even and odd numbers (this method is the commonest one).

(c) Calculate the correlation coefficient (r) of the two halves.

(d) Estimate the *reliability coefficient* for the whole test by applying the Spearman-Brown formula:

$$r^{tt} = \frac{nr}{1+(n-1)r}$$

$r^{tt}$ = reliability coefficient

n = number of parts into which the test is divided, in this case n = 2

r = *Pearson's* correlation coefficient

*Kuder-Richardson formula*: this measures the internal consistency of the test.

The procedure is as follows:

(a) Administer the complete test to the same group.

(b) Find the number of correct answers.

(c) Calculate the reliability coefficient by applying the Kuder-Richardson formula no. *21*:

$$r^{tt} = \frac{k}{k-1} \left(1 - \frac{\bar{M}\,(k-\bar{M})}{kS^2}\right)$$

where

k = number of questions in the test

$\bar{M}$ = arithmetical mean of the scores obtained by each student

S = standard deviation of the scores

*Estimation of reliability by calculating the standard error of the measurements*: the second way of estimating the reliability of a test is by calculating the standard error. As we have seen (diagram on page 338) the heterogeneity of the students and the duration of the test (speed) are among the factors which affect reliability and consequently validity. These two factors are related to the ability or the personality of the participants and are discriminating factors which will influence the arithmetical mean of the class (M) and the dispersion of the individual scores around that mean (standard deviation) or (S). If the standard deviation (S) is low, then the test does not have any great discriminating power so that its degree of reliability is low.

Since reliability is also related to psychological environment and test procedures, all aspects of which cannot be fully controlled, the scores obtained by a student are inevitably affected by "non-systematic" errors.

Calculation of the standard error (E) of the scores is one way of estimating the limits of the continuum in which the student's true score may be situated.

To estimate the standard error (E) of the scores the following formula is applied:

$$E = S\sqrt{1-r^{tt}}$$

where

$E$ = standard error

$S$ = standard deviation

$r^{tt}$ = reliability coefficient

In practice it is sufficient to calculate the standard deviation (S) and the reliability coefficient ($r^{tt}$) and to refer to a table giving the required standard error.

The degree of reliability is high if the difference between one test and another is low for a given group of students, i.e. E (standard error) is low.

* * *

If you are not yourself interested by statistics and cannot (or do not wish to) call in a statistician, the previous two pages are only of theoretical interest.

★ ★ On the other hand, the next ten pages will help you in making the absolutely essential minimum of statistical analysis (for relative criterion tests).

## STEPS IN ITEM ANALYSIS

1. AWARD OF A SCORE TO EACH STUDENT
2. RANKING IN ORDER OF MERIT
3. IDENTIFICATION OF GROUPS: HIGH AND LOW
4. CALCULATION OF THE DIFFICULTY INDEX OF A QUESTION
5. CALCULATION OF THE DISCRIMINATIONG INDEX OF A QUESTION
6. CRITICAL EVALUATION OF A QUESTION ENABLING A GIVEN QUESTION TO BE RETAINED, REVISED OR REJECTED.

## 1. AWARD OF A SCORE TO EACH STUDENT

A practical, simple and rapid method is to perforate on YOUR answer sheet the boxes corresponding to the correct answers. By placing the perforated sheet on the student's answer sheet the raw score (number of correct answers) can be found almost automatically.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | ☐ | ☐ | ☒ | ☐ | ☐ |
| 2 | ☐ | ☐ | ☐ | ☐ | ☒ |
| 3 | ☐ | ☐ | ☒ | ☐ | ☐ |
| 4 | ☐ | ☐ | ☐ | ☒ | ☐ |
| 5 | ☐ | ☒ | ☐ | ☐ | ☐ |
| 6 | ☐ | ☐ | ☒ | ☐ | ☐ |
| 7 | ☒ | ☐ | ☐ | ☐ | ☐ |
| 8 | ☐ | ☐ | ☐ | ☒ | ☐ |
| 9 | ☒ | ☐ | ☐ | ☐ | ☐ |
| 10 | ☐ | ☒ | ☐ | ☐ | ☐ |

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 11 | ☒ | ☐ | ☐ | ☐ | ☐ |
| 12 | ☐ | ☐ | ☒ | ☐ | ☐ |
| 13 | ☐ | ☐ | ☒ | ☐ | ☐ |
| 14 | ☒ | ☐ | ☐ | ☐ | ☐ |
| 15 | ☐ | ☐ | ☐ | ☒ | ☐ |
| 16 | ☒ | ☐ | ☐ | ☐ | ☐ |
| 17 | ☐ | ☒ | ☐ | ☐ | ☐ |
| 18 | ☒ | ☐ | ☐ | ☐ | ☐ |
| 19 | ☐ | ☐ | ☒ | ☐ | ☐ |
| 20 | ☐ | ☒ | ☐ | ☐ | ☐ |

## 2. RANKING IN ORDER OF MERIT

Assuming that the scores of 21 students have been obtained (alphabetical list on the left), this step consists merely in ranking (listing) students in order of merit (in relation to the score) proceeding from the highest to the lowest score. Let us assume the list as under A and then rank the students to obtain distribution B, ranging from 4 to 27.

A

| Student | Score |
|---|---|
| Albert | 7 |
| Alfred | 13 |
| Andrew | 19 |
| Ann | 25 |
| Brian | 27 |
| Christine | 19 |
| Elizabeth | 17 |
| Emily | 24 |
| Felicity | 16 |
| Frances | 14 |
| Frank | 26 |
| Fred | 17 |
| Harriet | 11 |
| Ian | 17 |
| John | 14 |
| Jennifer | 21 |
| Margaret | 16 |
| Michael | 9 |
| Paul | 16 |
| Peter | 4 |
| Philip | 16 |

B

| Order | Student | Score |
|---|---|---|
| 1 | Brian | 27 |
| 2 | Frank | 26 |
| 3 | Ann | 25 |
| 4 | Emily | 24 |
| 5 | Jennifer | 21 |
| 6 | Christine | 19 |
| 7 | Andrew | 19 |
| 8 | Elizabeth | 17 |
| 9 | Ian | 17 |
| 10 | Fred | 17 |
| 11 | Felicity | 16 |
| 12 | Margaret | 16 |
| 13 | Paul | 16 |
| 14 | Philip | 16 |
| 15 | Frances | 14 |
| 16 | John | 14 |
| 17 | Alfred | 13 |
| 18 | Harriet | 11 |
| 19 | Michael | 9 |
| 20 | Albert | 7 |
| 21 | Peter | 4 |

## 3. IDENTIFICATION OF HIGH AND LOW GROUPS

Ebel[1] suggests the formation of "high" and "low" groups comprising only the first 27% (high group) and the last 27% (low group) of all the students ranked in order of merit.

Why 27%? Because 27% gives the best compromise between two desirable but contradictory aims:

1. making both groups as large as possible;
2. making the two groups as different as possible.

Truman Kelley showed in 1939 that when each group consists of 27% of the total it can be said with the highest degree of certainty that those in the high group are really superior (with respect to the quality measured by the test) to those in the low group. If a figure of 10% were taken, the difference between the two means of the competence of the two groups would be greater but the groups would be much smaller and there would be less certainty regarding their mean level of competence.

Similarly, if a figure of 50% was taken the two groups would be of maximum size but since the basis of our classification is not absolutely accurate, certain students in the high group would really belong to the low group, and *vice versa*.

While the choice of 27% is the best, it is, however, not really preferable to 25% or 33%; and if it is preferred to work with 1/4 or 1/3 rather than with the somewhat odd figure of 27% there is no great disadvantage in so doing.

For the rest of our analysis we shall use 33%.

---

[1] Ebel, R. L. (1965) Measuring educational achievement, Prentice Hall, pp. 348-349.

## 4. Calculation of the difficulty index of a question

### Difficulty index

Index for measuring the easiness or difficulty of a test question, taking into account all the correct answers given by all the participants.

It is the percentage (%) of students who have correctly answered a test question, and indicates to what extent the students have found the question easy or difficult.

### Calculation

The following formula is used:

$$\text{Difficulty index} = \frac{H + L}{N} \times 100$$

where H = number of correct answers in the high group

L = number of correct answers in the low group

N = total number of students in those two groups

(Do exercise 1, page 471).

## 5. Calculation of the discrimination index of a question

### Discrimination index

An indicator showing how significantly a question discriminates between "high" and "low" students (see page 468). It varies from -1 to +1.

### Calculation

The following formula is used:

$$\text{Discrimination index} = 2 \times \frac{(H - L)}{N}$$

(Do exercise 2, page 471).

## 6. Critical evaluation of a question

This is based on the indices obtained.

→ Difficulty index: the higher this index the easier the question.[1]

In principle a question with a difficulty index lying between 30% and 70% is acceptable (in that range the discrimination index has more chances to be high).

If, for a test, you use a group of questions with indices in the range 30-70% then the mean index (50-60%) has every chance of being reliable as concerns its internal consistency or homogeneity.

→ Discrimination index: the higher the index the more a question will distinguish (for a given group of students) between "high" and "low" students; i.e. it does not favour the low group as compared with the high group. In other words, it helps you to find out who are the "best" students.

It is an essential index in preparing your question bank. Using the index, you can judge questions as follows:

| | | |
|---|---|---|
| 0.35 and over | : | EXCELLENT QUESTION |
| 0.25 to 0.34 | : | GOOD QUESTION |
| 0.15 to 0.24 | : | MARGINAL QUESTION - REVISE |
| under 0.15 | : | POOR QUESTION - MOST LIKELY DISCARD |

---

[1] It does not seem logical; it could be called the "easiness" index but this is not the way it is expressed in the literature.

## CHECK TEST

Given a group of 21 students (see page 467). Using 33% of them to constitute a high group of 7 and a low group of 7 (33% of 21), the following table shows the answers given by those two groups (high and low) to 10 multiple choice questions (numbered from 1 to 10 in the first vertical column). The correct answer for each of those ten question is given correspondingly in the second vertical column. In the 14 consecutive columns are shown the answers given by each student to each question.

| QUESTION N° | CORRECT ANSWER | RANKING IN ORDER OF MERIT | | | | | | | | | | | | | | H | L | H + L | H - L | DIF. IND. | DIS. IND. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Brian | Frank | Ann | Emily | Jennifer | Christine | Andrew | Frances | John | Alfred | Harriet | Michael | Albert | Peter | | | | | | |
| 1 | B | B | B | B | B | B | B | B . | . B | B | B | B | E | E | E | 7 | 4 | 11 | 3 | | |
| 2 | C | C | C | C | C | C | C | C . | . C | C | C | C | C | C | C | 7 | 7 | 14 | 0 | | |
| 3 | A | B | A | B | A | B | B | A . | . B | B | A | B | A | A | A | 3 | 4 | 7 | -1 | | |
| 4 | E | E | E | E | C | E | E | C . | . E | C | C | A | E | - | C | 5 | 2 | 7 | 3 | | |
| 5 | B | B | C | B | B | C | E | C . | . C | C | E | E | E | E | E | 3 | 0 | 3 | 3 | | |
| 6 | D | D | D | D | C | D | D | D . | . E | D | E | E | D | E | E | | | | | 57 | 0.57 |
| 7 | A | C | C | C | C | C | C | C . | . C | C | C | C | C | C | C | | | | | 0 | 0 |
| 8 | C | B | B | B | C | B | C | B . | . B | B | B | B | B | C | C | | | | | 28 | 0 |
| 9 | E | E | E | E | E | E | E | E . | . C | E | E | E | C | B | A | | | | | 71 | 0.57 |
| 10 | C | C | C | C | C | C | A | C . | . C | B | - | C | D | B | A | | | | | 61 | 0.76 |
| 33% | | | | | | | | | 33% | | | | | | | | | | | | |
| HIGH GROUP | | | | | | | | | LOW GROUP | | | | | | | | | | | | |

**Exercise** .......

1. Calculate H-L for questions 6 to 10.

2. Calculate the difficulty index and the discrimination index for questions 1 to 5.

Check your results on page 472.

## CHECK YOUR RESULTS

| QUESTION N° | CORRECT ANSWER | RANKING IN ORDER OF MERIT | | | | | | | | | | | | | | H | L | H + L | H - L | DIF. IND. | DIS. IND. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Brian | Frank | Ann | Emily | Jennifer | Christine | Andrew | Frances | John | Alfred | Harriet | Michael | Albert | Peter | | | | | | |
| 1 | B | B | B | B | B | B | B | B . | . B | B | B | B | E | E | E | 7 | 4 | 11 | 3 | 78 | 0.42 |
| 2 | C | C | C | C | C | C | C | C . | . C | C | C | C | C | C | C | 7 | 7 | 14 | 0 | 100 | 0 |
| 3 | A | B | A | B | A | B | B | A . | . B | B | A | B | A | A | A | 3 | 4 | 7 | -1 | 50 | -0.14 |
| 4 | E | E | E | E | C | E | E | C . | . E | C | C | A | E | - | C | 5 | 2 | 7 | 3 | 50 | 0.43 |
| 5 | B | B | C | B | B | C | E | C . | . C | C | E | E | E | E | E | 3 | 0 | 3 | 3 | 21 | 0.42 |
| 6 | D | D | D | D | C | D | D | D . | . E | D | E | E | D | E | E | 6 | 2 | 8 | 4 | 57 | 0.57 |
| 7 | A | C | C | C | C | C | C | C . | . C | C | C | C | C | C | C | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | C | B | B | B | C | B | C | B . | . B | B | B | B | B | C | C | 2 | 2 | 4 | 0 | 28 | 0 |
| 9 | E | E | E | E | E | E | E | E . | . C | E | E | E | C | B | A | 7 | 3 | 10 | 4 | 71 | 0.57 |
| 10 | C | C | C | C | C | C | A | C . | . C | B | - | C | D | B | A | 6 | 2 | 8 | 4 | 57 | 0.62 |
| | | 33% | | | | | | | 33% | | | | | | | | | | | | |

Conditions for the application of this procedure for item analyses, in particular:

1) it applies to relative criteria tests (the procedure leads to a choice of questions that tend to maximize variance and ensure discriminatory classification),

2) it is applicable only to questions scored dichotomously (1;0),

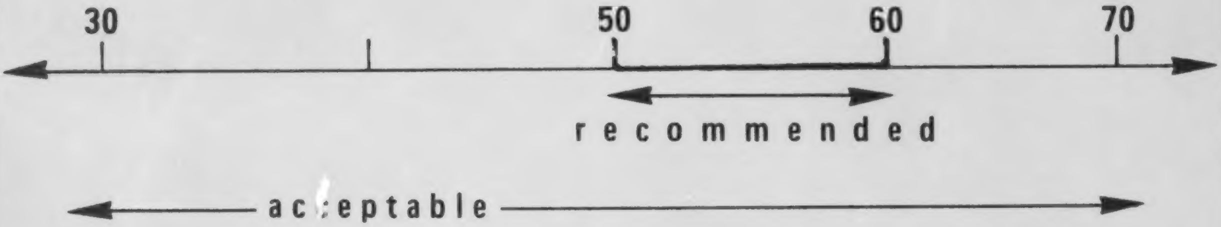
3) it should not be applied if the total number of students is very small (a minimum of 20 students could be proposed as a "pragmatic" criterion).

# USE OF INDICES

## AIM: Review of Questions

### DIFFICULTY INDEX

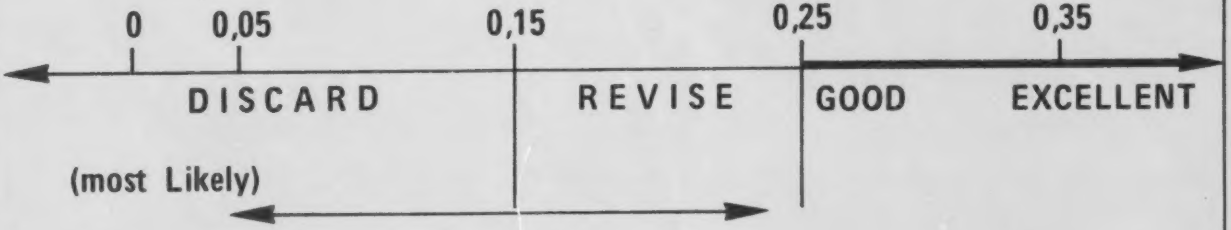
$$\text{dif. ind.} = \frac{H + L}{N} \times 100$$


30
50
60
70
recommended
acceptable

★

### DISCRIMINATION INDEX

$$\text{dis. ind.} = \frac{2\ (H - L)}{N}$$


0
0,05
0,15
0,25
0,35
DISCARD
REVISE
GOOD
EXCELLENT
(most Likely)

## CORRECTION FOR GUESSING[1]

There is a method for compensating for guessing . . . However, the procedure is far from being accepted by all docimologists. A mathematical formula clearly cannot take into account personality variations in students. The cautious student will be penalized as compared with the student who is more willing to try his luck.

On the other hand, (1) if adequate time is allowed to enable all the students who should pass to answer all the questions, and (2) if students are advised to try and answer ALL the questions asked[2] then the formula to correct for guessing becomes unneccessary . . .

. . . However, in case you insist on using the formula, it is as follows:

$$\text{Corrected score} = \text{number of right answers} - \left(\frac{\text{number of wrong answers}}{\text{number of possible choices} - 1}\right)$$

$$\text{or } CS = R - \frac{W}{N - 1}$$

For example, if in a test of 60 multiple-choice questions (one best response type) comprising five possible choices, if student X has 44 right answers, his corrected score will be:

$$CS = 44 - \frac{16}{5 - 1} = 44 - \frac{16}{4} = 40$$

---

[1] For further details see "Multiple Choice Examinations in Medicine", Hubbard and Clemans, pages 48-51.

[2] It is rare that it is impossible to eliminate at least one distractor in five entirely by chance. In this case the probability of answering ALL the questions correctly is already increased as compared to blind choice.

To facilitate the construction of a question bank it is advisable to enter the statistical results for each question on a separate card. These cards as a whole will constitute the "bank".

The front and the back of a card of this type could be as follows

## QUESTION ANALYSIS CARD

### FRONT

| | | |
|---|---|---|
| Subject | ENDOCRINE SYSTEM | Nature of question: MCQ |
| Objective tested | Ability to explain the physiological functioning of the thyroid gland | |
| Domain | COGNITIVE - Level 1 | |
| Question | Which of the following produces an increased secretion of thyroid hormone in a normal subject? | |
| Answers | A. Administration of TSH<br>B. Administration of thiocyanate<br>C. Administration of propylthiouracil<br>D. Administration of thyroxine<br>E. Some other treatment | |
| Reference | Sternberg, Chapter 2, page 112 - prepared by NMD in February 1972 | |
| | | |

## QUESTION ANALYSIS CARD

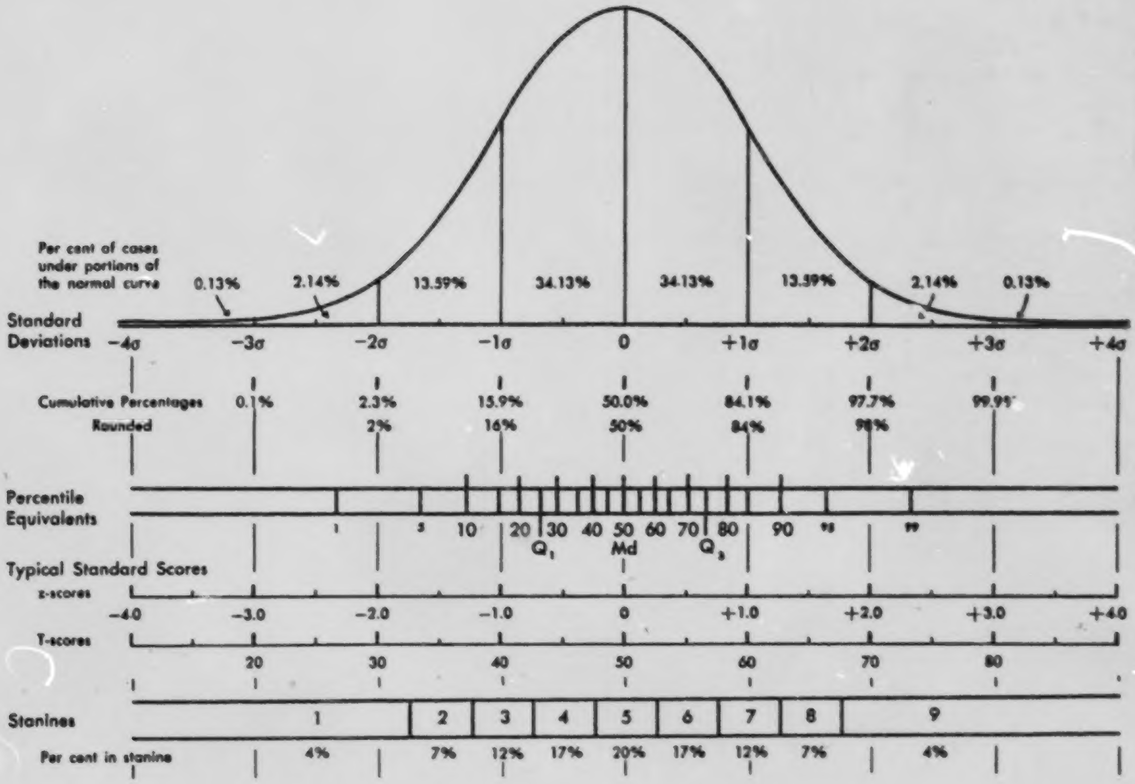
## BACK

| Course | Date | Nature of test | Group | Size of group | CHOSEN ANSWERS | | | | | | Difficulty index | Discrimination index | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A | B | C | D | E | Blank | | | |
| 2nd year | 6.72 | MCQ | High | 60 | 55 | 2 | 3 | 0 | 0 | 0 | 60 | 0.63 | |
| | | | Low | 60 | 17 | 5 | 3 | 7 | 28 | 0 | | | |
| CLIN.MED | 6.72 | MCQ | High | 10 | 7 | 0 | 2 | 0 | 0 | 1 | 57 | 0.30 | |
| | | | Low | 10 | 4 | 0 | 1 | 1 | 4 | 0 | | | |
| 2nd year | 6.73 | MCQ | High | 62 | 56 | 2 | 3 | 1 | 0 | 0 | 60 | 0.61 | |
| | | | Low | 62 | 18 | 8 | 3 | 8 | 24 | 1 | | | |
| 2nd year | 6.74 | MCQ | High | 70 | 60 | 0 | 2 | 3 | 5 | 0 | 59 | 0.57 | |
| | | | Low | 70 | 20 | 7 | 4 | 2 | 30 | 6 | | | |
| Specialty Board | 7.74 | MCQ | High | 20 | 18 | 0 | 2 | 0 | 0 | 0 | 80 | 0.20 | |
| | | | Low | 20 | 14 | 0 | 0 | 1 | 5 | 0 | | | |

## CONVERSION CHART

In the course of your reading you will come across research results expressed in cumulative percentages, percentile equivalents, Z scores, etc. . .

This conversion chart will help you to make comparisons, when necessary. However, it cannot be used to equate scores on one test to scores on another test.



## EXERCISE

(Check your answers on page 484)

**Question 1**

So-called "objective" written examinations are not suitable for measuring one of the following. Which?

A. Ability to recall knowledge precisely.
B. Ability to solve problems.
C. Ability to make decisions.
D. Ability to communicate with the patient.
E. Ability to interpret data.

**Question 2**

All the following stages, EXCEPT ONE, are recommended for scoring tests of the "essay" type:

A. Write the elements of the answer for each of the questions asked.
B. Correct the answers question by question rather than student by student.
C. Determine the pass score on the basis of a sample of answers.
D. Correct the answers while preserving the anonymity of the students.
E. Identify three levels only: honour, pass, fail.

**Question 3**

The content validity of a written test is usually obtained by means of:

A. Collective and careful review of the questions.
B. Pearson's correlation coefficient.
C. Factor analysis.
D. An "inter-rater" reliability coefficient.
E. A mean discrimination index.

**Questions 4 to 6**

A test with 50 questions is administered to a group of 45 students. There is a choice of five answers to every question. Only one of these choices is the correct answer. One point per correct answer is allocated in calculating the total score.

4. Assuming that none of the students have any knowledge of the test subject (i.e. they choose their answers by guessing), which of the following will be closest to the mean score of the group?

A. 0
B. 5
C. 10
D. 15
E. 25

5. On dividing this group of 45 students into 3 groups of 15 each, on the basis of the total score of each student, it is found that, for the first question, nine students in the high group and three in the low group have given the right answer. For this question the difficulty index is:

A. 12%

B. 27%

C. 30%

D. 40%

E. 60%

6. Under the same conditions, the discrimination index is:

A. 0.12

B. 0.27

C. 0.30

D. 0.40

E. 0.60

**Questions 7 and 8**

The following data concern a multiple choice question set to 300 students, the correct answer being D.

| | Choice of answers | | | | | |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | No answer |
| High group (100) | 22 | 1 | 10 | 67 | 0 | 0 |
| Low group (100) | 46 | 5 | 16 | 33 | 0 | 0 |

7. These data show that:

A. all the distractors were of good quality;

B. half the students answered the question correctly;

C. the question was of high validity;

D. The question was not very relevant.

8. In view of these data, the examination board may decide:

A. that this question should be reviewed since it is insufficiently discriminatory;

B. that this question should be discarded from the question bank;

C. that this question is of low validity;

D. none of the above.

**Question 9**

What could generally be expected on doubling the length of a test whose mean discrimination index is 0.52 (by adding questions more or less equivalent to the previous ones)?

A. Only a certain increase in the reliability of the test.

B. A certain increase in the reliability and the validity of the test.

C. Only a certain increase in the validity of the test.

D. A certain decrease in the reliability and validity of the test.

E. No effect on either the reliability or the validity of the test.

**Questions 10 to 15**

Use the following key in asnwering this series of six matching type questions:

A = traditional oral test

B = written test of the essay type

C = so-called written "objective" test (MCQ)

D = standardized practical test, or written and oral simulation tests (programmed examination)

Indicate the type of test most suitable for evaluating each of the following performances:

10. Recall of concepts.
11. Ability to solve problems.
12. Ability to communicate satisfactorily with the patient.
13. Verbal expression.
14. Skill in examining the patient.
15. Ability to make a synthesis.

**Question 16**

The system of "relative" criteria of competence implies the following consequences, EXCEPT ONE. Which?

A. Leads to an embarrassing disagreement among those responsible for applying the resultant decisions.

B. Leads to the failure of certain students in a particularly competent group.

C. Enables one group to become the arbiter of the standards according to which it is judged.

D. Enables "low group" students, who are however superior to the mean of the whole group to which they belong, to pass.

E. Creates an arbitrary fluctuation in the desirable level of competence at a given moment.

**Question 17**

A Z score corresponding to the mean (of a normal distribution) is equal to:

A. -1.0

B. 0.0

C. +1.0

D. A value which cannot be determined from the preceding information.

**Question 18**

The author of the following question was asked to establish its minimum pass level (MPL):

The diameter of a normal erythrocyte (according to WINTROBE) is equal to (in µm = micrometres)

A. 4.5

B. 6.5

C. 7.5

D. 8.5

E. 10.5

He felt that a student who "knew just enough to pass" should be able to reject right away choices A and E.

Indicate which among the following minimum pass levels corresponds to this choice:

A. 0.10

B. 0.20

C. 0.25

D. 0.33

E. 0.50

**Questions 19 and 20**

19. The calculation of the discrimination index provides statistical data which can be used in absolute criteria tests (true or false).

20. The calculation of the minimum pass level (MPL) can be used in criterion reference tests (true or false).

★

Answers suggested for the exercise on pages 479 to 482

| Question | Suggested answer | If you do not find the correct answer, consult the following pages again |
|---|---|---|
| 1 | D | 417-418 |
| 2 | C | 420 |
| 3 | A | 461 |
| 4 | C | simple "rule of 3" |
| 5 | D | 469 |
| 6 | D | 469 |
| 7 | B | 469 |
| 8 | D | 470 |
| 9 | B | 338 |
| 10 | C | 324, 416 to 429 |
| 11 | D | |
| 12 | D | |
| 13 | A | |
| 14 | D | |
| 15 | B | |
| 16 | A | 457 |
| 17 | B | 478 |
| 18 | D | 458-459 |
| 19 | False | 472 |
| 20 | True | 458-459 |

## PLEASE

..... IF YOU KNOW HOW TO DEFINE SPECIFIC OBJECTIVES

..... IF YOUR COLLEAGUES TURN GREEN WITH ENVY ON READING YOUR CRITERIA

..... IF YOU ARE ABLE TO CHOOSE THE MOST SUITABLE TEACHING TECHNIQUE

..... IF YOU CAN PUT IT INTO PRACTICE

..... IF YOU ARE A LEADER

..... IF YOUR STUDENTS ADMIRE YOU

..... IF YOUR EXAMINATIONS ARE VALID

..... IF YOUR SCORES ARE OBJECTIVE

DO NOT BE INFLUENCED BY ALL THIS . . !

...AND OVER-ESTIMATE THE IMPORTANCE OF YOUR OWN SUBJECT.

DO NOT FORGET RELEVANCE . . !

..... THE RELATIONSHIP BETWEEN YOUR TEACHING AND THE INSTITUTIONAL OBJECTIVES.

★

# 5

## HOW TO ORGANIZE A SHORT EDUCATIONAL WORKSHOP

PURPOSE OF THE CHAPTER 502
WHAT THE TERM WORKSHOP IMPLIES 503
AIMS OF A MINI-EDUCATIONAL WORKSHOP 504
HOW TO PLAN A MINI-WORKSHOP 505
ACTION CHECK LIST 506
OPEN A FILE 507
FUNDS 507
DATE OF THE WORKSHOP 507
CHOOSING THE PLACE FOR THE WORKSHOP 507
BOOKING A MEETING ROOM AND HOTEL ACCOMMODATION 508
CRITERIA FOR SELECTION OF PARTICIPANTS 508
COMMITTEE OF SPONSORS 509
SELECTION OF ASSISTANT ORGANIZERS 509
WORKING LANGUAGE 510
INVITATION TO THE PARTICIPANTS 510
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THEME OF THE WORKSHOP 515
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## PURPOSE OF THE CHAPTER

The purpose of this chapter is to facilitate the task of anyone who wishes to prepare and run an educational workshop.[1] It puts into practice most of the theoretical concepts mentioned in the Handbook.

It contains the basic documents (or refers to the documents) required to organize a very short workshop (lasting 3 to 4 days) known as a MINI-workshop.

It also includes simple instructions on how to use these documents and describes what has to be done to get the workshop under way.

The chapter obviously makes no claim to qualify the reader to organize all possible types of educational workshop regardless of the educational philosophy involved. The type of workshop proposed is designed to use the WHO EDUCATIONAL HANDBOOK (1976 or 1977 edition) as its source of theory.

Nevertheless, most of the general principles involved are also valid for longer workshops.

This chapter responds to the need often expressed by those attending workshops run by WHO to pass on a knowledge of the systematic approach to educational problems to their colleagues by means of a short workshop.

The method proposed itself uses the systematic approach. It also relies on such educational principles as:

- Allowing the participant to prepare and select the objectives to be reached will increase his motivation;
- Giving the participant an active role will make teaching more effective;
- Providing the participant with regular opportunities to see the progress he is making will increase his learning speed and improve the quality of the knowledge and skills he acquires.

---

[1] For a description of what is implied by the term "workshop" see the next page.

## WHAT THE TERM WORKSHOP IMPLIES

A workshop is a meeting during which experienced people in responsible positions come together with experts and consultants to find solutions to problems that have cropped up in the course of their work and that they have had difficulty in dealing with on their own. Participants themselves select the objectives they wish to reach and help in choosing the problems for group work.[1]

AN ESSENTIAL FEATURE OF THE WORKSHOP IS COMPLETE ACTIVE INVOLVEMENT BY EACH PARTICIPANT: THE WHOLE POINT OF ATTENDANCE IS TO WORK AND TO LEARN FROM PRACTICAL EXPERIENCE

One of the commonest methods used in workshops is group discussion of selected problems, the size of the group being small enough to encourage full participation by each member and large enough for each member to gain from the experience of the others. There is nothing magical about a small group but it does offer each member an opportunity to make his own contribution. It gives participants as far as possible a chance to discuss, and solve, those problems of greatest interest to them. The fact that each member can find something in what the others have experienced that has a bearing on the questions of most interest to himself will make his work more meaningful. The workshop method makes everyone (organizers and participants) responsible for helping to find solutions to the problems selected. Participants may have to act as group leaders or rapporteurs. The organizers are generally there to be consulted by participants and to help them where necessary (but they do not give lectures or impose solutions).

The workshop programme makes provision for plenary sessions, discussions in small groups and other activities but does not follow a strict hour-by-hour timetable. On the contrary, the programme adapts itself to the way the work is going. For example, a plenary session will be held whenever there is a need to pool the results of group discussion, to clarify a point for all participants or to introduce some activity that requires unanimous approval.

A MINI-workshop is a short workshop (lasting three or four days in the case described in this document).

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[1] These problems and objectives are occasionally decided (in most cases by correspondence) before the workshop begins to allow the various participants time to prepare for it. However, this does not happen with a mini-workshop.

## AIMS OF A MINI EDUCATIONAL WORKSHOP

The workshop aims at introducing participants to a systematic approach to educational problems. They must, so to speak, not only be made "hungry for more" (i.e. anxious to carry on learning about the subject and increasing their skills) but also given "food for the journey" (documentation containing enough references to enable them to make progress after the workshop is over).

The workshop aims at stimulating a given proportion of participants to wish to reach at least those objectives set out in the Educational Handbook (see pages 525 to 527 of the present chapter) in the course of the ensuing year.

It has been found from experience that some participants may go far beyond these aims and embark on activities such as:

- defining X% of the specific objectives for the subject they are responsible for;
- replacing X% of traditional lecturing by a more suitable method;
- starting a bank of examination questions that meet the criteria of objectivity, validity, etc. (X questions);
- calculating the discrimination index or acceptable level of performance for X% of the examination questions;

etc. etc.

# HOW TO PLAN A MINI-WORKSHOP

You have already had first hand experience, as a participant, of an Educational Workshop and you have decided to organize and run a mini-workshop yourself in order to let your colleagues know about the systematic approach to educational problems. This will, however, involve a good deal of work. The following CHECK LIST has been drawn up to help you.

Only those items considered ESSENTIAL appear on this list. Not all of them may be applicable in your case and you may also find that some items you need are missing.

Nevertheless

THE SUCCESS OF A WORKSHOP WILL DEPEND LARGELY
ON THE WAY IT IS PLANNED AND ON THE ARRANGEMENTS MADE

**before**

THE OPENING SESSION

Unless you start work AT LEAST six months beforehand you will be increasing your chances of failure.

The greater the flexibility and adaptability of equipment and staff the higher the chances of success.

One of the aims of the workshop is to meet the needs of the participants. Your apologies will be no use to them if something goes wrong. On the other hand, they will be favourably impressed if, when something unforeseen does happen, corrective measures are taken to keep the workshop running smoothly.

No matter what you do something unexpected will always happen!

## ACTION CHECK LIST

| | No. of days before or after workshop | | see page |
|---|---|---|---|
| BEFORE | - 365 to - 180 | - Decision to organize a mini-workshop | 505 |
| | | - Open a file | 507 |
| | | - Find a source of funds | 507 |
| | | - Have a draft budget approved | 507 |
| | | - Set the dates for the workshop | 507 |
| | | - Choose the place to hold the workshop | 507 |
| | | - Book a meeting room and accommodation for the participants | 508 |
| | | - Define the criteria for selecting participants | 508 |
| | | - Appoint a Committee of Sponsors | 509 |
| | | - Choose the assistant-organizers | 509 |
| | | - Take account of the working language | 510 |
| | - 120 | - Start the procedure for inviting participants (inform them of the aims of the workshop and send them Doc. 1 (Working methods) and Doc.2 (Theme of the workshop) | 510 |
| | - 60 | - Select the participants from those applying | 521 |
| | - 45 | - Inform participants that they have been selected and | 521 |
| | - 30 | - Send them the documentation (Educational Handbook and Document 3) | 523 |
| | | - Arrange for document reproduction equipment to be available | 531 |
| | | - Prepare a checklist of the equipment required | 531 |
| | | - Inform the press | 531 |
| | - 8 | - Review the list of participants | 532 |
| | - 2 | - Arrange the room and inspect the premises (with equipment check list) | 532 |
| | | - Call a meeting of the assistant organizers and review the programme for the workshop | 534 |
| | - 1 | - Have a friendly drink | 534 |
| DURING | * | - Background organization ... of the workshop - timetable of work | 534 |
| | | - functioning of the workshop | 535 |
| | | - organizing the breaks | 536 |
| | | - group photograph | 547 |
| | | - make an immediate evaluation (Doc.4) | 537 |
| AFTER | + 10 | - Send a letter of thanks to the assistant organizers | 547 |
| | + 15 | - Prepare a report on the workshop | 547 |
| | + 30 | - Send the report to the participants<br>to the responsible authorities | 547 |
| | | - Start long-term evaluation | 547 |
| | | - collect data | |
| | + 180 to - 365 | - visit the participants | |
| | | - organize an evaluation meeting | |
| | | - publish an evaluation report | |

## OPEN A FILE

Correspondence relating to the planning, running and evaluation of a workshop will soon reach proportions that call for proper filing. A suitable system might be a looseleaf file with the following subdivisions:

- Budget
- Workshop site
- Selection of participants
- Selection of assistant organizers
- Documentation
- Equipment checklist
- Publicity, press, etc.
- Evaluation

## FUNDS

Whatever social and political system you are working under you will need a budget. The person or persons who will ultimately be responsible for authorizing the expenditure involved will need at least one ESTIMATE. To work this out the following simple formula is suggested:

$$\boxed{E = (T + S)N \times 1.25}$$

E = Estimate

$$\left.\begin{array}{l} T = \text{Cost of return travel}^{*} \\ S = \text{Living expenses (accommodation, food)} \end{array}\right\} \text{ per participant}$$

N = Number of participants

In other words, travel costs and living expenses will amount to 80% of total costs, leaving the remaining 20% to cover the other expenses (room, reproduction of documents, etc). Where necessary add a percentage corresponding to the annual rate of inflation . . . . . and get your budget approved.

## DATE OF THE WORKSHOP

As the workshop will nearly always be attended by teachers, this should be taken into account when setting the dates of the workshop in order to avoid clashing with their professional commitments (e.g. sitting on an examination board, annual congress).

You should also check whether the dates coincide with public or religious holidays, sports events or political meetings, as these may create problems with regard to reserving hotel rooms.

## CHOOSING THE PLACE FOR THE WORKSHOP

(over 6 months before D day)

It has been found from experience that, to make sure participants will attend on a full-time basis, the workshop will have to be held in a place far enough away from where participants live to enable them to take part in all activities without interruption and prevent them from being able to go home after the sessions or, more importantly, return to their laboratories or their patients.

* This obviously implies a substantial financial investment but one that is justifiable from the point of view of cost/effectiveness.

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[1] Before working this out, read the paragraph on "choosing the place for the workshop" on this page.

The place chosen should be agreeable and the conditions comfortable enough for participants to be able to recall with pleasure their first full-time plunge into the depths of the systematic approach to education.

## BOOKING A MEETING ROOM AND HOTEL ACCOMMODATION

(6 months before D day)

Waste no time in making the necessary bookings. Do it in writing and insist on written confirmation detailing the conditions you have specified, particularly as regards to meeting room (see p. 532 for details). Wherever possible, a visit to the premises is recommended before making a final decision. If the meeting room is too small, too noisy, badly ventilated or badly lit, the workshop may suffer irreparably.

## CRITERIA FOR SELECTION OF PARTICIPANTS

### Number of participants

It has been found from experience that as many as 35 participants (seven groups of five) can be handled by one organizer. By following the maxim, "the less you teach the more they learn", it should be possible to increase the number of participants still further.

However, there are no strict rules and it is advisable not to have more than about 15 participants for a first trial.

The number of participants is in practice limited by what the organizer feels he is capable of coping with and by what the participants think they need in the way of help from the organizer.

The documentation provided for the mini-workshop should be such as to allow each participant to advance by his own efforts and with the help of the stimulation provided by other participants rather than with the help of the organizer.

### Type of participant

* Homogeneity

Although it is not necessary to have all the same kind of participants for a mini-workshop, since this type of workshop is mainly intended to provide a stimulus to the individual, it is advisable to select participants who will be in a position to work together after the workshop is over and who, by forming a critical mass, will have a greater chance of success.

On the other hand, it has been found from experience that it is not recommended to have a workshop, designed to act as an INTRODUCTION to a new approach, attended by a mixed group representing several professions (for example: physicians, nurses, dentists, medical assistants, sanitary engineers, etc.). The mini-educational workshop is going to force each participant to question many concepts that had previously seemed firmly established. This process is hard enough without increasing frustration by insisting that it is carried out outside the peer group. The aim at this stage is not to create team spirit. It may be necessary to organize a mixed group later on in order to reach this goal.

- Voluntary participation and willingness to innovate

Attendance at the workshop should be VOLUNTARY and each participant should already have demonstrated his desire for change by having adopted new methods of his own. He should if possible be in a position of responsibility or be likely to acquire responsibility.

In cases where some of the documentation is not yet available in the national language, or if assistant organizers who do not speak the national language have to be called on, allowance must be made for this and participants selected who can at least READ the language used in the documents available.

* To be accepted as a participant it is ABSOLUTELY ESSENTIAL that:

applicants are aware they will be FULL-TIME PARTICIPANTS for the duration of the workshop and undertake to abide by this provision.

## COMMITTEE OF SPONSORS

Setting up a Committee of Sponsors will not only permit you to honour influential members of official circles but will also draw the attention of such circules to the action you have initiated and encourage them to follow it up. It is important that people in administrative positions (such as Rectors, Directors of Health and Deans) should be represented on such committees which will be called on to apply the selection criteria defined earlier.

## SELECTION OF ASSISTANT ORGANIZERS

(4 months before D day)

As you yourself have already attended a workshop of this kind, do not be afraid in your effort to take SOLE charge of a group of about 15 participants.

However, if you have not enough confidence in yourself yet call in[1] a more experienced consultant, preferably from another school or faculty, and this will allow you to take a rather larger group (20-25).

In subsequent efforts with greater numbers of participants you are strongly advised to take on two (for 20 participants) or three (for 30 participants) assistant organizers (from those attending an earlier workshop). You will have to make sure at least four months before the workshop starts that they will be able to come so as to give them time to make further study of the documents, in particular of the WHO EDUCATIONAL HANDBOOK.

You are recommended to choose assistant organizers belonging to disciplines other than those represented by the participants in order to prevent the proceedings turning into a discussion of their subject by experts rather than a consideration of the methodology of education.

The assistant organizers will have the task of finding answers to questions put forward by the participants and of channelling any questions from participants that they cannot deal with themselves to the principal organizer.

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[1] By contacting either your WHO Regional Office or the Chief, Educational Planning, WHO Headquarters.

## WORKING LANGUAGE

Apart from the WHO Educational Handbook,[1] the remaining documents (1, 2, 3 and 4) are short enough to allow their translation into the language of the participants of the workshop. At any rate all discussions, whether in small groups or in plenary session (unless outside consultants are used) may obviously be carried out in the national language. Make arrangements at once for the necessary translation to be done.

## INVITATION TO THE PARTICIPANTS

(4 months before D day)

It is now time to start the procedure leading up to the final selection of participants (see page 521). As far as possible, you are recommended to generate a demand for places in excess of the number you have decided on (page 508) so that you will be able to correct the situation if there are any last minute cancellations. You are therefore advised to get in touch now with the colleagues you wish to contact. A personal letter will generally be preferable to posting up a notice, but your decision here will depend on local conditions. What "information" should be sent out at this stage? The main points to be covered are:

(a) aims of the workshop - on the basis of the contents of page 504 prepare a letter of invitation adapted to the target population

(b) what is implied by the term workshop - you may annex to your letter the text on page 503

(c) working methods of the workshop (document No. 1)

(d) theme of the workshop (document No. 2)

The text of the last two documents (1 and 2) will be found on the pages that follow. You may have the requisite number of copies made by means of a stencil if you do not have access to other methods of reproduction such as an electronic-stencil or a fast photocopying machine for which the pages of this document may be used as originals. In any case the pages should be renumbered and the place and dates of the workshop should be mentioned on the cover page of each document under the title "workshop in educational planning".

Your letter of invitation should also mention that full-time participation is essential (see the text in the box on page 509) and indicate any language stipulations.

Lastly, you should set a deadline for applications (45 days after the date of dispatch of the letter of invitation), mentioning that each successful applicant will be informed of his selection at the latest 45 days before the start of the workshop and that the basic documents[2] will be sent to him at that time (under separate cover if you have a limited budget).

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[1] Which exists in English, French, Italian and Spanish and is in preparation in Bulgarian, Czech, German, Hungarian, Polish and Portuguese.

[2] N.B. Now is the time to order what copies you need of the EDUCATIONAL HANDBOOK FOR HEALTH PERSONNEL, WHO 1977, from your bookseller (see list on back cover) unless your national authorities already have a stock which they can make available to you.

WORKSHOP IN EDUCATIONAL PLANNING

DOCUMENT N°.

# 1

## WORKING METHODS OF THE WORKSHOP

## Working methods

The working methods offered to you for this meeting may be somewhat different from those you are traditionally used to. It does not mean that these are new methods. They have been widely used outside the University. Their efficiency has been experimentally tested. They derive from the application of recent education theories. If they were to be identified by their main characteristic one would say they put emphasis on active participation of the learner while in traditional systems he is maintained in a relatively more passive role. The aim of those methods is also to encourage you to demonstrate a critical and constructive attitude and to incite you to find out solutions to your own problems. To that effect practical exercises will lead you to propose realistic solutions. Generally speaking, the working methods used in the workshop will enable you to put the educational principles recommended in the EDUCATIONAL HANDBOOK into practice.

The working methods are the following:

1. Free choice of personal objectives

   - In order to ensure that the workshop fully meets your educational needs you will be invited to select the objectives you wish to reach before the end of the workshop (see document No. 3).

2. Preliminary reading assignments (orientated towards practical exercises)

   - In order to make available to you a base of theoretical knowledge in the field of educational planning that you may need to find solutions to practical problems and attain the objectives you have selected, you will be invited to read pre-selected documents. It should therefore be made clear at this point that there will be no lecturing on the part of the organizers, not even a "short introduction to...".

3. Clarifying sessions

   These sessions are held, in general, daily as the first working session. Their aim is to ensure that the reading assignments have been understood in the way their authors meant. They are not intended however to be in-depth discussions as these will be held either during work group sessions or during summary sessions.

4. Practical exercises

   - These exercises are described in detail in the Educational Handbook. They are to be dealt with individually first. Then discussion will start by comparing each one's proposed solutions. This exchange of views may start in pairs before extending to the entire small group; if the exercise implies that each one within the group has a specific task related to a common goal, it is up to the group to get organized. This task distribution will NOT be done by the organizers. Group dynamics will operate with its highs and lows, periods of tension and relaxation as in all human endeavours.

### 5. Group presentation

- Plenary sessions will be held as often as necessary. Their aim will be to allow group solutions to be presented, not for the purpose of judging groups but to compare ideas for possible consensus under the leadership of either a participant or an organizer.

### 6. Next working day preview

- Each day before closing a short period will be reserved for a preview of the following day's activities and a reminder of the aims of reading assignments.

### 7. Individual consultations

- In view of the biological principle of individual differences it is most likely that participants will progress at different rates, desiring to study in more or less depth certain questions, or be interested in differing applications of the theories and methods proposed during the workshop. To that aim organizers will make themselves available on request for individual consultations on subjects of mutual interest.

### 8. Formative evaluation

8.1 Pretest - In order to direct your efforts and inform you of your progress in learning during the workshop, an evaluation process is proposed to you. Details are given on page 9 of the Educational Handbook This test will help you to identify the "educational areas" in which a refresher may be needed. The object of the pretest is not to find the "right" answer but simply to register that you have not found it. The purpose of the workshop is to help you to find it, either during the workshop itself or in the ensuing months. The post-test will give you an opportunity as time goes by of measuring your progress.

8.2 Daily evaluation - At the end of each daily session time will be set aside for joint assessment of the extent to which the working methods used have helped you towards reaching the objectives you have selected and for proposing any change in functioning of the workshop.

8.3 Evaluation questionnaire - Shortly before the end of the meeting you will be invited to express your opinion on the organization of the workshop by means of a questionnaire (Document 4). The results will be analyzed during the last session.

8.4 Long-term evaluation - In order to help you in assessing the benefit you will accrue from this workshop, you will be asked to define explicitly the professional objectives you expect to reach within the next twelve months in relation to the experience acquired during the workshop. All participants are recommended to meet together twelve months after the workshop in order to evaluate what they have achieved.

These various aspects of the working methods that will be used during the workshop will be clarified during the first session.

* * * * *

You may now start preparing for the workshop in whatever time you have available.

- If you want to get a general idea of the field that will be explored during the workshop, study Document No. 2 (Introduction to Educational Planning)
- If you want to select the personal objectives you wish to reach by the end of the workshop, study Document No. 3 (Programme Preparation for the Workshop), which you will be sent if selected to participate
- If you want to go still further, you will make use of the Educational Handbook in the light of the objectives you have selected.

## WORKSHOP IN EDUCATIONAL PLANNING

DOCUMENT NO.

# 2

THEME OF THE WORKSHOP -

INTRODUCTION TO EDUCATIONAL PLANNING

# THEME OF THE WORKSHOP

The pattern of teaching has remained the same for centuries. The privileged enclaves of the universities have often remained indifferent to agitation outside them and the needs of the community, the practical aspect of the matter, has been left to chance. The details of each country's situation are changing at an ever increasing pace but unfortunately no attention or very little attention has yet been paid to them and the training of health workers still follows the traditional systems of the past. There is a need to ensure that teaching programmes are relevant.

To continue to copy past models, or foreign models in the case of developing countries, is out of the question.

The aims of the training system for medical and health workers, at all levels, must be reviewed in terms of the needs of each country and must proceed from prospective study.

No educational system can be effective if its aims have not been clearly formulated. The members of a health team must be specially trained for the tasks they will be called upon to perform in view of the conditions prevailing in the services in which they will be expected to work.

These tasks must be defined in relation to a plan which lays down a health policy and specifies the type of services to be provided, the priorities to be observed, the number of staff required, etc.

This will make it possible to adapt professional education to the needs specified in this way.

A stock of management, planning and educational skills is available to help teaching staff at existing or future health science centres and to assist health administrators who have training responsibilities.

The definition of educational objectives for education and training centres is essential as a first stage.

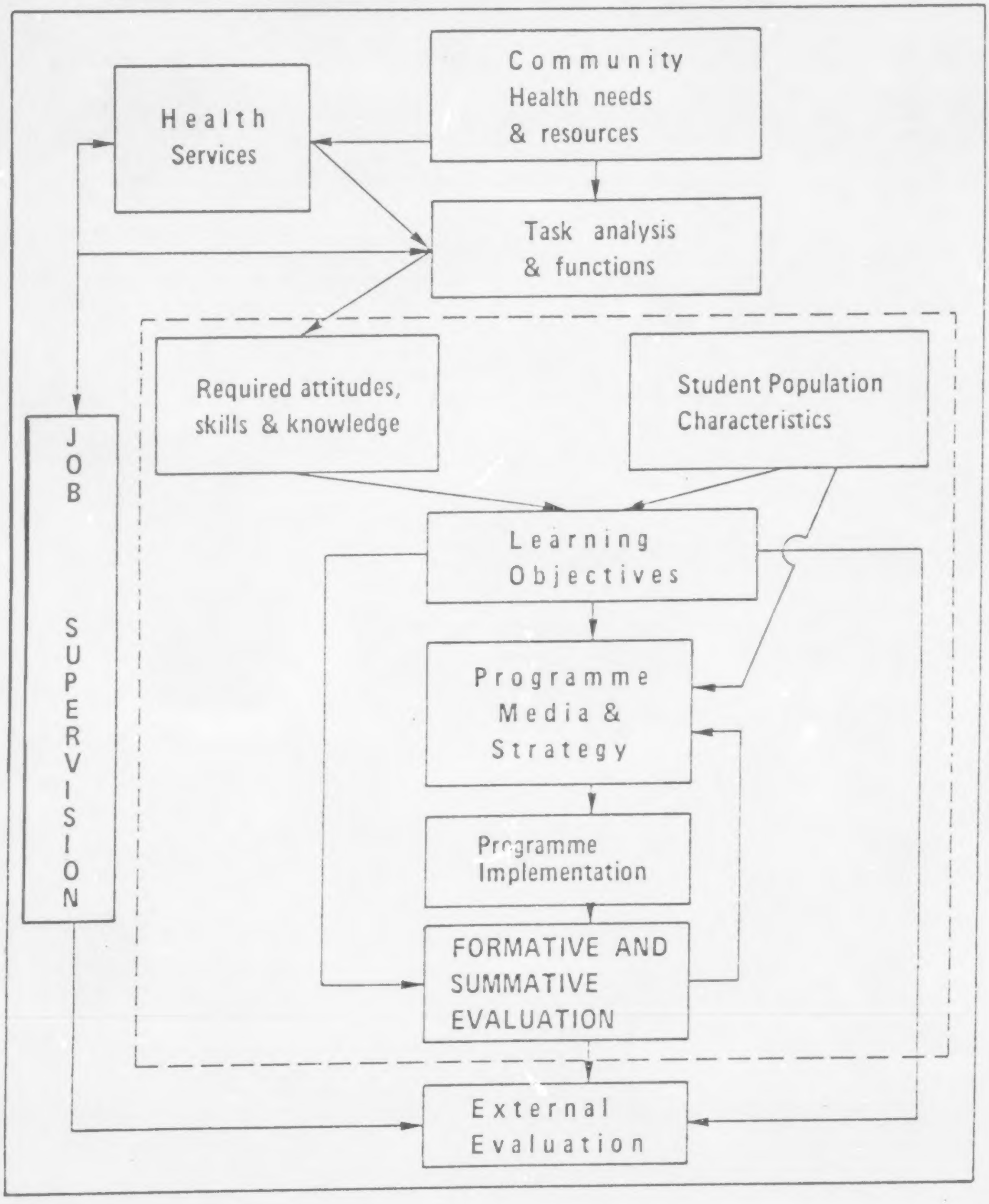
Thus a training programme, instead of deriving from a fund of knowledge built up non-selectively over the centuries, should be selectively designed in terms of the educational aim to be reached. If the aim changes with time, the programme should also be amended in consequence.

Educational objectives should therefore take their source from a study of needs and possibilities and should be based on a definition of the tasks that staff will be called upon to fulfil during their working life in any given type of health work.

Preliminary definition of the tasks (health care) to be provided is stressed because it is a prerequisite for any relevant definition of educational objectives (see diagram on next page). If the bases from which the educational objectives are derived are bad, then the educational system used, however "good" it is, is likely to give "bad" results, and a "bad" message is likely to be communicated "well", which is by no means the intended aim.

The method traditionally used to draw up an educational programme is to bring together eminent professors and the result of their deliberations is presented as a list of chapter headings. Often existing programmes are used as the main source of data for the preparation of the new programme. The professors

ORGANIZATIONAL DIAGRAM SHOWING THE RELATIONSHIPS
BETWEEN THE SUBSYSTEM "EDUCATION"
(inside the broken–line quadrilateral)
AND THE SUBSYSTEM "HEALTH SERVICE"


Community Health needs & resources
Health Services
Task analysis & functions
Required attitudes, skills & knowledge
Student Population Characteristics
JOB SUPERVISION
Learning Objectives
Programme Media & Strategy
Programme Implementation
FORMATIVE AND SUMMATIVE EVALUATION
External Evaluation

indicate the number of hours to be devoted to the various subjects to be dealt with: this generally leads to a conflict of personalities and it is the most forceful, the most persuasive, sometimes the most irascible or noisiest of the participants in the discussions who obtains the largest number of hours. The result is that the time variable becomes a constant and that competence becomes a variable.[1]

The general objectives of a medical school, for example, are, some say, axiomatic: "We train doctors of international quality. It is not necessary to develop the description any further; medicine is universal." However, when we try to get the teachers to define a little more fully what they are talking about, we see how wide and fundamental the divergencies are as soon as we leave the sphere of generalities. The conflicts between fundamentalists and clinicians, between advocates of preventive and of curative medicine, are the results of those divergencies. This conflict becomes acute during the periodic curriculum reforms.

It is proposed to define educational goals by means of behavioural terms corresponding to the tasks to be accomplished. In other words, the definition must indicate what the graduates of a given school will be able to DO at the end of their period of education or training that they were not able to do before.

These goals define what the student should be able to do, not the teacher. A teacher's expectation of high student learning motivation will not become a reality until students feel a freedom to learn, that is to say when they become involved in the decisions concerning their own educational objectives. Moreover, these objectives have to be explicitly defined and offered for their choice; even better, the students will have participated in establishing them.

When educational objectives are described in a practical and detailed manner it is then possible to determine with some precision those learning activities suitable for attaining an objective and those which are almost or completely unsuitable. This is the second stage. Now is the time to work out the study programme (the sequence of learning and teaching activities and their coordination), to estimate equipment and staff requirements and make sure that the educational skills of the latter are adequate for their task, i.e. making it easier for students to learn.

The lack of an explicit definition of educational objectives makes discussions on programmes, teaching methods and evaluation methods difficult and often futile.

The methods of evaluation (of students, teachers, and methods) will in fact depend on the objectives to be achieved. Evaluation (this is the third stage) consists in being able to say to what MEASURABLE EXTENT and HOW the objective laid down has been achieved. If care has not been taken to establish a MEASURABLE objective, it will be difficult to make a valid evaluation. To choose what type of examination to set, for example, without educational objectives makes no more sense than trying to choose a measuring instrument without knowing what has to be measured. It is only during the last decades that investigators in the field of testing and measurement (docimology) began to work out a solution to the problem posed. Here, too, the strength of tradition and emotional reactions are making themselves felt.

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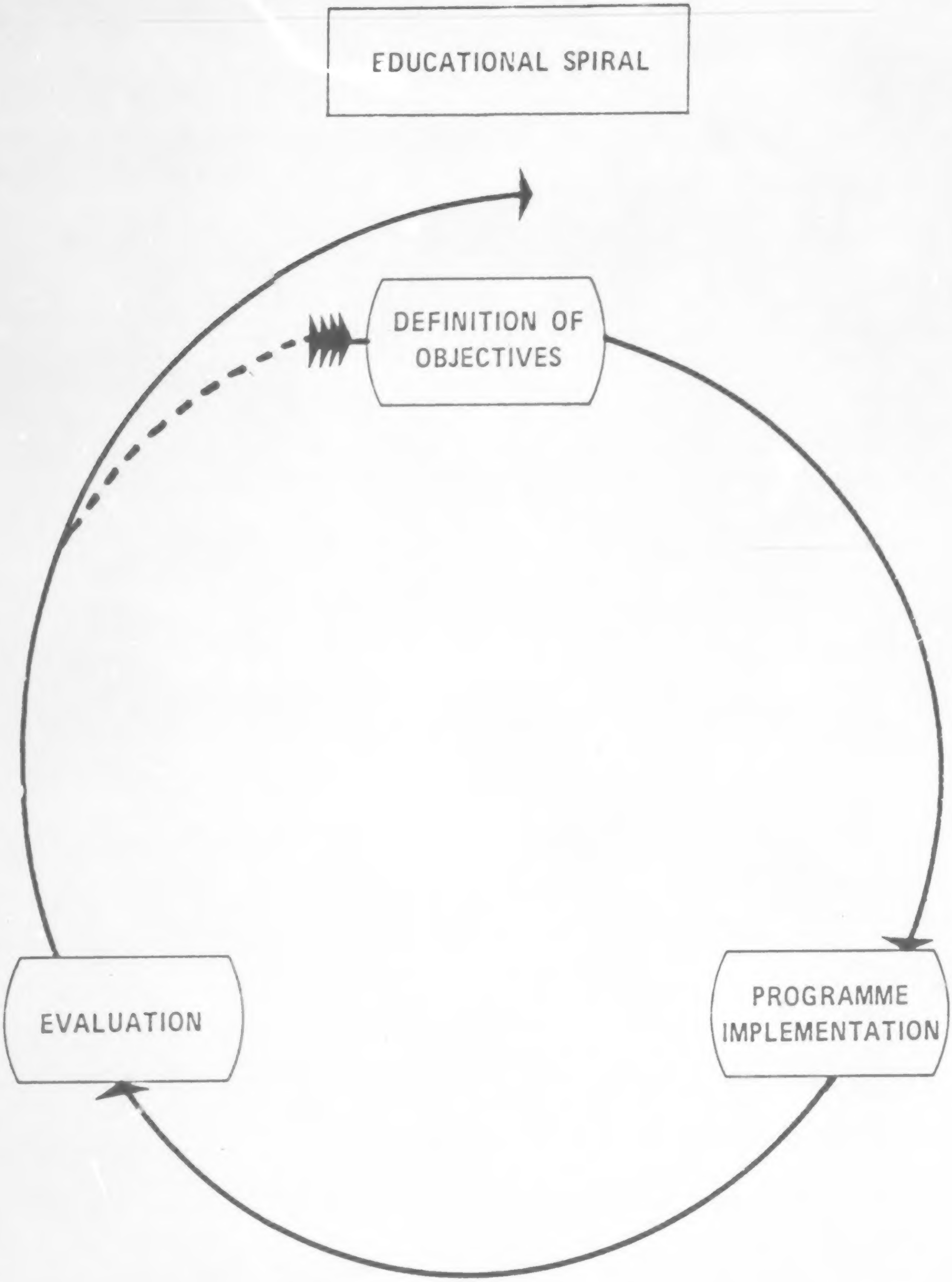
[1] For example, the length of medical studies is fixed by administrative regulations at 6 years (or 7, 5, etc.): this is the time constant. On the other hand, there is hardly any definition of the competence of graduates, and this can lead to great variability.


EDUCATIONAL SPIRAL
DEFINITION OF OBJECTIVES
PROGRAMME IMPLEMENTATION
EVALUATION

The theme of the workshop will therefore be the health manpower training process and will consider the three main stages of this process (see the Educational Spiral, p.519):

- defining relevant educational objectives
- drawing up an effective educational programme
- implementing a valid evaluation system.

*

SELECTION OF PARTICIPANTS (2 months before D day)

The deadline for applications has now expired and you should convene the Committee of Sponsors. They will choose from among the applicants those who correspond most closely to the criteria defined earlier (see page 508). Your function will be to make sure that the Committee follows these rules properly.

In addition to the number of participants decided on, the Committee should select some RESERVES (20-25% extra) to provide replacements in the case of last minute cancellations.

CONFIRMATION OF PARTICIPANTS (45 days before D day)

It is now time to write to the applicants who have been selected, reminding them of the conditions of participation (full-time attendance obligatory), the place and the dates, asking them to bring Documents 1 and 2 with them (having studied them carefully) and sending them Document 3 (on the organization of the workshop programme) and the EDUCATIONAL HANDBOOK.

In point of fact, these last two documents could just as well not be distributed until the start of the workshop since they do not have to be studied beforehand.[1] However, it has been found from experience that many participants complain at the time of final evaluation that they were not given ALL the documentation before the workshop (including those who would not have had time to read it). In short, although it is not essential for participants to receive Document 3 and the HANDBOOK one month before the workshop, there is no reason why they should not have them.

Do not forget that you should have an adequate number[2] of Document 3 "Programme Preparation" reproduced as you have already had done for Documents 1 and 2 (page 510).

Order now the necessary number of copies of the Educational Handbook from your Regional Office or from your own national authorities if they have ordered a stock of them.

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[1] It could even be said that if a highly motivated future participant has studied the Handbook thoroughly, he has to some extent gone beyond the aims of the workshop and has no longer any reason to attend as a participant. He could eventually help the assistant organizers.

[2] Take the opportunity of having Document 4 "Evaluation of the Workshop by the Participants" reproduced now for distribution towards the end of the workshop (see page 536).

## WORKSHOP IN EDUCATIONAL PLANNING

DOCUMENT NO.

# 3

PROGRAMME PREPARATION
FOR THE WORKSHOP

## PROGRAMME PREPARATION

In order to prepare a working programme for the workshop that is relevant to your own needs in the field of education, the following objectives are proposed to you (listed in three categories). Please select those of interest to you that you wish to reach before the end of this workshop.

As the duration of this workshop is limited try to be realistic in your choice. Some of these objectives may require only a few minutes' work; others may require several hours to allow for study of the documents made available to you (see suggested text after the list of objectives).

Once you have made your selection decide which objectives are the most important to you and rank order them. Fill in the last page and give it to the workshop organizer.

In the light of what you have selected, you will be able to draw up a working programme. You will be given a list of the participants who have chosen the same objectives as yourself, so as to facilitate the organization of small working groups sharing common objectives.

*

➡

## THE CONCEPT OF EDUCATIONAL OBJECTIVES

1. Define the following terms: educational objective; prerequisite level; institutional objective; specific objective; cognitive domain; affective domain; psychomotor domain.

2. List the qualities and sources of an educational objective.

3. Define the principal tasks of the members of a health team.

4. List the educational objectives, at institutional level, appropriate to the institution in which you teach.

5. Define six specific educational objectives corresponding to a teaching theme with which you are familiar, stating explicitly what you consider the student should be capable of "doing" at the end of his instruction (which he was not capable of doing previously), corresponding to cognitive, affect and psychomotor domains.

6. Critically analyse six specific educational objectives (drafted by another participant) and indicate especially if they include all the necessary elements (activity, content, condition, criterion).

7. Assign the educational objectives to their appropriate domain; affective, cognitive or psychomotor.

8. Make a list of the possible reactions of your colleagues in the faculty if they had to define specific objectives and suggest strategies to overcome their reactions.

## THE TEACHING/LEARNING CONCEPT

9. Identify the differences existing between the following concepts: education, teaching, learning.

10. Describe the new trends in the teaching/learning system.

11. Enumerate ten conditions which facilitate learning.

12. Indicate the aims and general methods of teaching.

13. Identify at least two advantages and two disadvantages for each category of teaching/learning activity.

14. Select a teaching method that will make an educational objective easier to attain.

15. Draw up an organizational diagram representing what you consider workable in your establishment for the introduction of an "integrated teaching programme" with consideration of constraints and strategies to overcome them.

16. Identify which role as a teacher you intend to assume in order to facilitate the learning of students for which you are responsible.

17. Identify the obstacles liable to be encountered during the setting up of a competency based curriculum and describe the tactics that may be used to overcome them.

18. Fill in a specification table for a programme.

19. Define the concept of relevance with regard to a programme.

20. Define for a specific objective in a non-cognitive domain what theoretical knowledge you consider a student should possess BEFORE starting to work in view of that objective (prerequisite level).

    What theoretical knowledge would be necessary for the student to attain that objective.

* * * * *

## THE EVALUATION CONCEPT

21. Draw a diagram showing the relationship between evaluation and the other components of the education process.

22. Define the principal role of evaluation.

23. Define the aim and purposes of evaluation.

24. Describe the difference between formative and summative evaluation.

25. Define the organization (in the form of an organizational diagram) and stages of an evaluation system which would be appropriate for your institution. Indicate particularly:

    a) the most essential decisions you consider should be taken on the basis of an evaluation,

    b) the aims of the system and sub-systems in regard to decisions to be taken and the object of the decisions (teachers, students, programme).

26. Identify the obstacles to improvement of an evaluation system and the tactics to overcome them.

27. Define the following terms: validity, reliability, objectivity, and describe the relationship which exists between them.

28. Define the following terms: prerequisite level test, pre-test, interval test, comprehensive pre-final test and indicate their purpose and the stage at which they are carried out.

29. List the good and bad points of a test.

30. Compare the advantages and disadvantages of tests in current use.

31. Establish an evaluation system relevant to each of the objectives (see objective 5): questionnaire, written examination ("objective" or essay), oral examination, direct observation, etc. Suggest alternatives.

32. Design a system to be used by STUDENTS for evaluation of teaching.

33. Set an essay question (open book test) or a set of six short open answer questions, indicating the answer(s) called for in each case in order to obtain an objective scoring (score sheet).

34. Draw up three multiple choice questions (MCQ) (in the cognitive domain) using the principles set out in the documentation. At least two of three objectives must measure an intellectual process superior to level 1, "recall", (either at level 2, "interpretation of data", or at level 3, "problem-solving").

35. Distinguish between a relative and an absolute criteria test.

36. Calculate the minimum pass level for a MCQ test.

37. Determine the scoring criteria and minimum pass level for a mini-test (composed of the questions mentioned in objectives 33 and 34).

38. Do an item analysis of a question (index of difficulty and discrimination) and interpret the results.

39. Give the advantages and disadvantages of programmed examination.

40. Fill in a "specification table" for an examination.

* * * * *

## THEORETICAL BACKGROUND THAT WILL HELP YOU REACH THE EDUCATIONAL OBJECTIVES OF THE WORKSHOP

| For objective | Study the following pages of the Educational Handbook | For objective | Study the following pages of the Educational Handbook |
|---|---|---|---|
| 1 | 6 and 7; 105-109; 116-119 and Glossary | 21 | 304 and 305 |
| 2 | 120; 138-139; 143 | 22 | 302-315 |
| 3 | 111-114; 120 | 23 | 318-321 |
| 4 | 118-131 (and obj. 1 & 3) | 24 | 316-317 |
| 5 | 138-148 (and obj. 1) | 25 | 322; 338-340 (and obj. 22 and 23) |
| 6 | 149 (and obj. 5) | 26 | 227; 343 (and obj.25) |
| 7 | 151-166; Glossary | 27 | 335-339 |
| 8 | 173; 227 (and obj. 1) | 28 | 407-410 |
| 9 | 108; 207-216; Glossary | 29 | 404-406; 412-415 |
| 10 | 205-206; 259-267 | 30 | 416-418 |
| 11 | 215 and 216 | 31 | 324-327 (and obj. 5) |
| 12 | 208-209 | 32 | 329-333 |
| 13 | 219-226 | 33 | 417; 420-421; 429 |
| 14 | 209-210 (and obj. 5 & 13) | 34 | 152-155; 428-429; 435-440 |
| 15 | 227-244 | 35 | 457-460 |
| 16 | 227-231; 245-251 | 36 | 458-459 (and obj. 35) |
| 17 | 227-231; 236-253 | 37 | 452-453 (and obj. 33 and 34) |
| 18 | 251-253 | 38 | 465-473 |
| 19 | See references in Glossary p.610 | 39 | 442-450 |
| 20 | 116-117; 138-149; 274 (and obj. 10) | 40 | 253; 454 and 455 |

CIRCLE THE NUMBERS CORRESPONDING TO THE OBJECTIVES
YOU HAVE CHOSEN AND INDICATE THEIR ORDER OF PRIORITY

| Objective | Order of priority | Objective | Order of priority | Objective | Order of priority | Objective | Order of priority |
|---|---|---|---|---|---|---|---|
| 1 | | 11 | | 21 | | 31 | |
| 2 | | 12 | | 22 | | 32 | |
| 3 | | 13 | | 23 | | 33 | |
| 4 | | 14 | | 24 | | 34 | |
| 5 | | 15 | | 25 | | 35 | |
| 6 | | 16 | | 26 | | 36 | |
| 7 | | 17 | | 27 | | 37 | |
| 8 | | 18 | | 28 | | 38 | |
| 9 | | 19 | | 29 | | 39 | |
| 10 | | 20 | | 30 | | 40 | |

ADDITIONAL OBJECTIVES
(optional)

By the end of the workshop I should like to be able to:

Name . . . . . . . . . . .
(in block letters)

Tear out this page and give it to the workshop organizer during the first session.

## STAFF AND EQUIPMENT NEEDED FOR DOCUMENT REPRODUCTION DURING THE WORKSHOP

(One month before D day)

It will be extremely useful to be able to call on the services of a typist for typing the documents resulting from group work. Participants generally wish to have access to the results of their colleagues' work. Equipment for fast, good quality reproduction will therefore also need to be available.

It will also be extremely useful to be able to provide each participant (before the end of the first day of work) with a list of the participants who have chosen the same objectives as himself as this will facilitate discussion between participants (see page 524 document 3) and the formation of working groups of participants with the same objectives.

## EQUIPMENT CHECKLIST

(one month before D day)

| | | | |
|---|---|---|---|
| Note pads (one for each participant + 20%) | | | |
| Pencils (one for each participant + 50%) | | | |
| Rubbers/erasers (one for each table) | | | |
| Pencil sharpeners (one for each table) | | | |
| Two-hole punch (1) | | | |
| Adhesive tape (2 rolls) | | | |
| Stapler (1) | | | |
| Waste paper baskets (one for each table) | | | |
| Drawing pins (2 packets) | | | |
| Cardboard envelope files (2 for each participant) | | | |
| Overhead projectors (2) | | | |
| Spare projector lamps (2) | | | |
| Electric extension flex (6 metres) | | | |
| Electric adapter plugs (2) | | | |
| 110/220 transformer (check local voltage) | | | |
| Transparent cellulose sheets (50) | | | |
| Marker crayons for writing on cellulose sheets (12) (water soluble) | | | |
| Blackboard for flip chart | | | |
| Photocopying machine | | | |
| Dictionary | | | |

You will find this list useful for checking what you should bring with you to the workshop and for making sure the day before the workshop begins that EVERYTHING is in place.

## PRESS RELATIONS

Depending on the local situation, it may be worth deciding to inform the press. If so, it will always be best for you to prepare a press release yourself rather than leaving this task to a journalist, no matter how conscientious he may be.

If you invite the press to interview the participants (for example when the group photograph is being taken) the best time for this will be during the break on the last day (see timetable on page 534). This is also a time when you may invite your superiors, those providing funds and other dignitaries. NEVER choose the first day for this purpose . . . as the participants will then be in a state of considerable confusion!

### REVIEW OF THE LIST OF PARTICIPANTS

(one week before D day)

In some cases there will be cancellations. As these occur you should get in touch with the applicants selected as reserves and so fill the empty places. Make sure once again that participants have all the documentation required and that they know the date and place of the workshop.

### ARRANGEMENT OF THE ROOM

(2 days before D day)

The meeting room should be arranged so as to:

- allow participants to sit at small tables in groups of three to five;
- allow the use of an overhead projector (two would be preferable in order to allow two documents to be compared together).

The following arrangement is suggested for 15, 25 or 35 participants (see page 533).

During plenary sessions, participants need just to turn to face the organizer. Make sure that everyone has a good view of the projection screen and the discussion leader.

It has been found from experience that the noise threshold (in group discussions) is quite bearable and that this arrangement is preferable to separating groups in different rooms. It allows for much more flexibility in organizing the sessions.

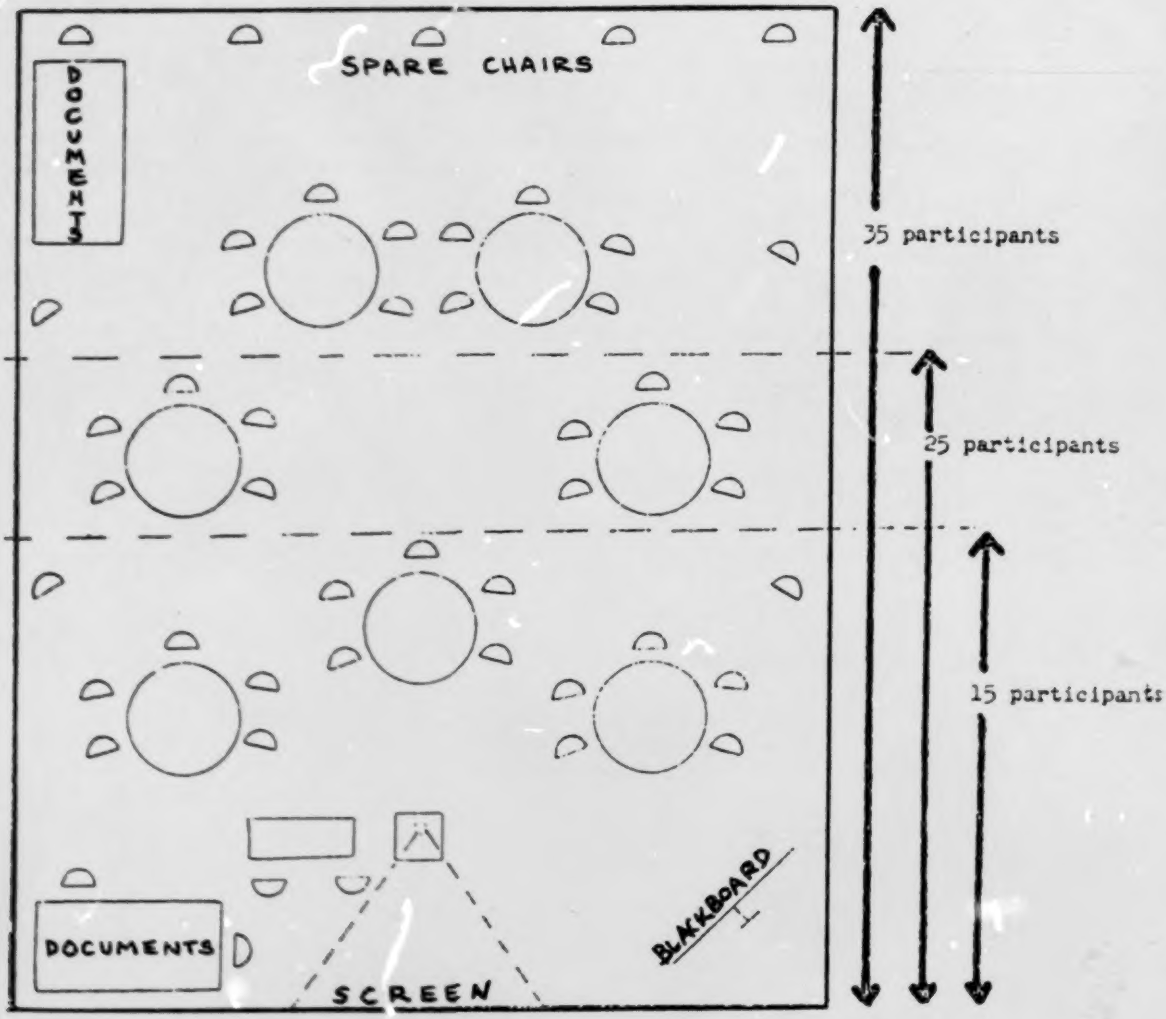
Make sure that the room is not too near a source of noise (restaurant, school, demolition site, etc.).

The less the meeting room looks like a "classroom" the better it will be.

Make sure that each participant has enough table space on which to lay out his documents and see that it is well lit.

The overhead projector does not require a darkened room, but you should still make sure the day before the workshop starts at a time when natural daylight is at its brightest that the picture it projects is clearly visible. Make sure that there is at least one electric power point that works and have an electric extension flex and spare projector lamp available. In addition have a stock of transparent cellulose sheets and marker crayons (erasable) available so that participants, or you yourself, may illustrate any remarks that may be made in plenary sessions.

Use the check-list of the equipment you will need during the workshop at the time you are inspecting the room on the day before the meeting starts (page 531).


SPARE CHAIRS
DOCUMENTS
35 participants
25 participants
15 participants
BLACKBOARD
DOCUMENTS
SCREEN

ARRANGEMENT OF THE ROOM

(depending on the number of participants)

## COORDINATING THE ASSISTANT ORGANIZERS

(2 days before D.day)

All assistant organizers should arrive at the site of the workshop without fail AT LEAST TWO WHOLE DAYS before the start of the workshop and should have been told how important this coordination period is.

The principal organizer should make sure that each assistant organizer knows what is expected of him during the workshop and is prepared to carry it out.

The two days preceding the workshop will therefore be a sort of dress rehearsal for what is expected to happen during the workshop. Each assistant organizer ought to give an account in his own words of the part he thinks he can play.

All organizers will need to be thoroughly familiar with the documentation for the workshop and these two days should provide a good opportunity for organizers to exchange views and prepare the way for working together smoothly. Several informal meetings will probably be useful, one of which should be in the room in which the workshop is to be held.

## THE EVENING BEFORE

In theory all the participants will have arrived and have their hotel rooms. Before supper, you are recommended (if financially possible) to organize a "friendly drink" to break the ice and allow participants and assistant organizers to make themselves known to each other. This should be as informal as possible.

## D-DAY IS HERE . . . .

Although it is in the nature of a workshop not to have a strict hour-by-hour timetable, in the case of a mini-workshop some details may be given on the procedure it is recommended to follow, at least for the first day. The first hours of the first day are of crucial importance. The working atmosphere will change in the course of the three days, and roughly speaking the first day will be one of confusion, the second one of productive thought and the third one of stunned realization that there is much more to learn than appears at first but that it is worth making the attempt and the real work is only just beginning . . . .

With regard to the rate at which the subject matter is dealt with in the time available, each participant should be left to work at his own pace and according to his own system of priorities. On the other hand, as the participants form themselves into working groups, a "common tempo" could be established as follows: It would seem appropriate that Chapter I of the HANDBOOK, which was started on the first day, should be "finished" by the break on the second day, that Chapter II should be considered during the second session on the second day so as to leave the third day for Chapters III and IV.

## TIMETABLE OF WORK

It is not recommended to arrange more than five hours (two two-and-a-half hour sessions) of structured sessions a day. On the other hand, two to three hours (of non-structured work) will be needed for individual exercises or for reading documents. It would seem from experience that a single morning session lasting four to five hours (8 to 10.30; and 11 to 1.00) with a short break (30 minutes) is to be preferred to two sessions (morning and afternoon) separated by a lunchbreak.

FIRST DAY: FIRST SESSION
8 to 10.30 a.m.

## 1. Opening

In your opening remarks you will of course formally welcome the participants, thank those who have made the workshop possible, recall the overall aims of the workshop (see page 504 ) and situate it in relation to the local teacher training situation. Make clear too that the workshop offers each participant a golden opportunity for uninterrupted thought on problems that are universally admitted to be important but are frequently neglected; that no-one there is any cleverer than anyone else; that the workshop belongs to the participants and will be what they make of it; and that the third day will not be the end of the workshop but rather the start of a long and exciting process. These remarks should not take more than five minutes.

## 2. Document clarification

Go on without a break to this item. Ask the participants to turn to Document No.1 (Working Methods of the Workshop) and go through it page by page and paragraph by paragraph asking them if there are any points which they wish CLARIFIED. If there are no questions on a paragraph, describe the central theme of the paragraph without going into details. If a question is raised, ask whether any other participant would like to clarify the point concerned. Do not forget (and remind participants where necessary) that the object of the exercise is to clarify obscure points and not to discuss the subject matter in depth. There will be time for such discussion throughout the rest of the workshop either in small working groups or, occasionally, in plenary session.

It has been found by experience that there is no point at this stage in a clarification session for Document No.2 (Theme of the workshop). The requisite definitions and detailed explanations are dealt with in the exercises designed to help achieve the workshop objectives.

It will now be between 8.45 and 9.15 a.m. and time to pass on to the next item.

## 3. Programme preparation

The (individual) programme of work for each participant will now be prepared. Ask participants to turn to Document No.3 (Programme preparation) and make sure that the text of the first page has been understood. Next, mention that the 40 objectives listed are the same as those in the EDUCATIONAL HANDBOOK and that the cross-references to the relevant pages of the Handbook have been given (on page 528, Document 3) to facilitate selection of objectives. The selection made should be indicated by filling in the last page of Document 3 and handing it in to the assistant organizers by 10.30 a.m. at the latest. After the break, from the information produced in this way, you will post a list of participants who have chosen identical objectives so that they may form themselves into groups for joint work.

The first plenary session will now be over and the time will be between 9 and 9.30 a.m. From this point on until the start of the break (10.30 to 11.00) it will be the task of the assistant organizers to deal individually with any requests from participants. Towards 10.00 a.m. make a rapid tour of the room to see how the participants are doing and by about 10.15 a.m. remind them where necessary that they have 15 minutes left for handing in the last page of Document No.3.

## FIRST BREAK (10.30 to 11.00 a.m.)

This is when the organizers will draw up the lists (on a flip chart) of the participants who have selected identical objectives in order to enable them to form groups for joint discussion. Gifted as you are with ubiquity you should also make sure that coffee, tea or other drinks, and rolls and sandwiches will be made available to the participants.

## FIRST DAY: SECOND SESSION
## 11.00 a.m. to 1.00 p.m.

By about 10.55 a.m. invite the participants to come back to the room and tell them they may start working (on an individual basis to start with) through the list of objectives they have selected; that if they wish to find out what they know, they should now take the pretest (at least on the first chapter of the Handbook); that they may call on you if they need any help; that they may subsequently, if they so wish, start exchanging their work and discussing it with other participants, whom they may choose from the list given on the flip chart (which you may now have reproduced for general distribution); and that there will be another plenary session at 12.45 p.m. for the daily evaluation session. Until then take no other action apart from being available to give help if requested.

At 12.45 p.m. ask for everybody's attention and invite each table to discuss (in five minutes) the good and bad aspects of the first morning and ask for a verbal report of his discussion from a representative of each table.

At 12.55 p.m. you will have a few minutes left to congratulate participants on their dedication and keenness and reassure them if they are feeling completely confused about what is happening that things will be better tomorrow and even better the day after tomorrow. Lastly, invite them to spend the afternoon continuing to clarify their ideas by further reading on any points worthy of attention and tell them that you will be available for individual consultation.

It will now be 1.00 p.m. and you may take your leave of the participants and wish them a pleasant afternoon.[1]

## SECOND DAY

The participants will start organizing their work themselves and your task will be to help them do this. Start the day with a short clarification session (15 minutes) which this time it will be worth your while to initiate within the groups and finish in plenary session. Next, mention that as on the previous day there will be a plenary session at 12.45 p.m. for an evaluation of the day's work and invite everyone to set to work. Add that in the event of one (or several) working groups forming and wishing to submit the results of their work to the others, other short plenary sessions may be held on request. Make sure that, should this happen, there are enough transparent cellulose sheets and marker crayons for participants to make their reports using the overhead projector.

At the end of the session, after evaluation of the day's work, invite participants to draw up for the following day a list of the professional objectives they wish to reach during the next 12 months in the light of what they have "learnt" during the workshop, and ask them to fill in the evaluation questionnaire (Document No.4) and return pages 539-544 to you at 6 p.m. (page 546 will tell you how to analyse the results of the questionnaire).

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[1] Another scenario may be imagined in which by 8.30 a.m. the participants have settled down to a poker game. This would indicate that you need to review your planning procedures, including the method of selecting participants (page 508).

# WORKSHOP IN EDUCATIONAL PLANNING

DOCUMENT NO.

# 4

## EVALUATION OF THE WORKSHOP BY THE PARTICIPANTS

## QUESTIONNAIRE FOR EVALUATION OF THE WORKSHOP BY THE PARTICIPANTS

### Instructions for questions 1 - 35

Use the following code to indicate the extent to which you agree or disagree with each of the statements made below:

Code
1. Strongly disagree
2. Disagree
4. Agree
5. Agree strongly

The difference between 1 and 2 or between 4 and 5 is one of degree only.

Example: If you want to express your complete disagreement with the statement, circle the figure 1 as follows: [✓ 1] 2 4 5

Please feel free to make any comments you think necessary (making reference to the number of the question) in the space reserved for the purpose on the last page.

*

## I. Aspects relating to the planning of the workshop

Do not write in this column

Q.1 I was given sufficient information on the aims and methods of the workshop before my arrival 1 2 4 5 ☐☐

Q.2 The planning of the workshop reflected the educational principles that were discussed there 1 2 4 5 ☐☐

Q.3 It was clearly explained to me at the start how I was to choose my objectives for the workshop 1 2 4 5 ☐☐

Q.4 I feel that I participated in the preparation of the programme in a satisfactory manner 1 2 4 5 ☐☐

Q.5 The goals of the workshop appeared to me to be of immediate interest for my professional activities 1 2 4 5 ☐☐

Q.6 It was clear to me from the start of the workshop that I was expected to play an active part in it 1 2 4 5 ☐☐

## II. Aspects relating to the relevance and utility of the working methods

Q.7 I found the documentation provided of an acceptable quality 1 2 4 5 ☐☐

Q.8 Enough documentation was provided to allow me to take an active part in the discussion of the subjects concerned 1 2 4 5 ☐☐

| | | | Do not write in this column |
|---|---|---|---|
| Q.9 | The information given by the EDUCATIONAL HANDBOOK helped me to reach the objectives I had chosen for the workshop | 1 2 4 5 | ☐☐ |
| Q.10 | The working methods used during the workshop encouraged me to take an active part in it | 1 2 4 5 | ☐☐ |
| Q.11 | I have already during the workshop begun to put new knowledge into practice | 1 2 4 5 | ☐☐ |
| Q.12 | Spending as much time as possible on individual work during the workshop helped me to learn | 1 2 4 5 | ☐☐ |
| Q.13 | During the workshop I was given the opportunity to work at my own pace | 1 2 4 5 | ☐☐ |

## III. Aspects relating to the way the workshop was run and to the attitude of the organizers

| | | | |
|---|---|---|---|
| Q.14 | The organizers displayed a satisfactory open-mindedness | 1 2 4 5 | ☐☐ |
| Q.15 | The general atmosphere of the workshop was conducive to serious work | 1 2 4 5 | ☐☐ |
| Q.16 | The organizers gave me opportunity for critical comment | 1 2 4 5 | ☐☐ |
| Q.17 | The organizers made use of any critical comments I made during the workshop | 1 2 4 5 | ☐☐ |
| Q.18 | The organizers made every effort to help me reach my objectives for the workshop | 1 2 4 5 | ☐☐ |

Do not write
in this column

Q.19 The way the workshop was conducted was in line with the educational principles it discussed 1 2 4 5

Q.20 I consider that enough time was given for individual or group discussions with the organizers 1 2 4 5

Q.21 Enough time was devoted to clarifying the documents 1 2 4 5

Q.22 Enough time was given to small group discussion 1 2 4 5

Q.23 Enough time was given for practical exercises 1 2 4 5

Q.24 Enough time was given for individual work 1 2 4 5

Q.25 Enough time was given for the presentation of work inplenary session 1 2 4 5

Q.26 The attitude of the organizers was conducive to "free learning" 1 2 4 5

IV. Aspects relating to the benefits gained by the participants

Q.27 The workshop helped me to improve my knowledge of education theory 1 2 4 5

Q.28 The workshop helped me to develop a favourable attitude towards the systematic approach to educational problems 1 2 4 5

|  |  |  | Do not write in this column |
|---|---|---|---|
| Q.29 | The workshop has encouraged me to put the knowledge I have gained into practice after the workshop is over | 1 2 4 5 |  |
| Q.30 | The workshop will help me to encourage my colleagues to learn and make use of new educational methods | 1 2 4 5 |  |
| Q.31 | The workshop has increased my confidence in my ability to achieve my personal objectives in the medium-term (in one year's time) | 1 2 4 5 |  |

V. Aspects relating to evaluation of the workshop

|  |  |  |  |
|---|---|---|---|
| Q.32 | I felt that the pre-test and the follow-up test helped me to make a useful assessment of the knowledge I gained | 1 2 4 5 |  |
| Q.33 | The pre-test was a useful exercise and showed the advantages of this technique | 1 2 4 5 |  |
| Q.34 | The practical exercises showed the usefulness of "feedback" during the learning process | 1 2 4 5 |  |
| Q.35 | I found the daily evaluation sessions useful | 1 2 4 5 |  |

With regard to the planning of the workshop, its method of work and the attitude of the organizers, note below and give actual examples of:

(a) The factors which impressed you most favourably

. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

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(b) The factors that impressed you least favourably

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**Further comments and suggestions**

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## VI. Professional objectives

1. Write down the objectives you hope to achieve during the year following this workshop.
2. Write down, for each of these objectives, a working timetable to enable you to reach them.

(continue on the other side)

NAME . . . . . . . . . . . . . .

Keep a copy of this page and give the original to one of the workshop organizers.

## Note for the Organizer on what to do with the answers to this Questionnaire

A very simple analysis may be carried out as follows.

Take an uncompleted questionnaire and mark beside each question the answers given by each participant. For example, for 30 participants, the answers to question 6 might be:

| | | | | |
|---|---|---|---|---|
| Q.6 | It was clear to me from the start of the workshop that I was expected to play an active part in it | 1 2 4 5 | 134 | 89.3 |

In other words, two participants considered that they did not understand from the start that they were expected to play an active part in the workshop while the 28 others understood this. Multiplying the number of answers by the corresponding coefficient gives a total of $(2 \times 2 + 10 \times 4 + 18 \times 5) = (4 + 40 + 90) = 134$.

The "satisfaction index" is calculated by multiplying this number by 20 (i.e. 100 divided by the maximum coefficient 5) and dividing it by the number of participants, in this case 30. This gives

$$\frac{134 \times 20}{30} = \frac{2680}{30} = 89.3\%$$

You are then recommended to make a note of any questions with a "satisfaction index" BELOW 60%[1]. If there are none, identify the five questions with the lowest "satisfaction index" and then the five questions with the highest "satisfaction index". Let the participants have these results at the final evaluation session on the last day of the workshop.

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[1] The satisfaction index is calculated in such a way that "average satisfaction" is $\frac{100 + 20}{2} = 60\%$

**THIRD DAY** (don't forget to have a group photograph taken during the break)

After a short period for clarification, set aside the first session for work on Chapters III and IV of the Handbook. It is very important to keep the second session of this last day for finalizing the individual professional objectives to be reached during the next 12 months. (See Document No. 1, paragraph 8.4). These should be the subject of exchanges of views between participants and of group discussion before being handed to the organizers. The last half-hour of the last day should be given over to an evaluation session ending with a few closing remarks dealing mainly with the FUTURE.

**LETTER OF THANKS** (15 days after the workshop)

It is now time to thank everybody who has helped you, including those who have provided funds for the workshop, the members of the Committee of Sponsors and the assistant organizers, if any. Inform them in the letter that they will shortly be sent the report on the workshop.

**REPORT ON THE WORKSHOP** (15 days after D day)

Even if the purpose is only to inform those who have provided the funds for the workshop or to help participants to inform other colleagues, it is a useful exercise to prepare a report during the week following the workshop.

The report will contain:

- an INTRODUCTION giving a brief description of the local context which led to the organization of the workshop
- the GENERAL AIMS of the workshop
- a description of the PROGRESS of the workshop describing how participants adapted themselves to the working methods
- some selected samples of the results of individual or group work
- the list of documents used during the workshop
- the results of immediate evaluation (including an analysis of Document No.4)
- the list of participants (with their addresses)

**LONG-TERM EVALUATION** (at the latest one year after D day)

Longterm evaluation is essential since it is the only way which will give some measure of the ACTUAL impact of a workshop.

It will be based on an assessment of the extent to which each participant has reached, failed to reach or exceeded all or some of the PROFESSIONAL OBJECTIVES he set himself at the end of the workshop (see page 545). An assessment of this kind may be made by means of a questionnaire, by individual interviews or preferably by bringing all participants together again for a one-day meeting. A report summing up the results of long-term evaluation is well worth preparing.

## AFTERWARDS .....

Do not succumb to the illusion that everything is now going to change in the institution in which you work. Do not think that from one day to the next conservative elements will turn into reformers, passive elements into active ones or opponents into supporters.

Firstly, if you manage to persuade at least 20% of those taking part in the workshop to make a lasting and visible change in their teaching habits during the ensuing year, you may consider the workshop to have been a success. This will not be the case if all you do is record how many participants expressed satisfaction during the evaluation on the last day of the workshop (even if the figure is 100%).

Secondly, your work is not yet over. Do not let the seed you have planted with so much effort wither away. Continue to stimulate your colleagues in responsible positions in your teaching institutions to see that those participants who improve their teaching methods are "rewarded" in some way.

......If this is impossible, do something about it yourself - congratulate them - this will always be appreciated.

A WORKSHOP

DON'T THINK IT WILL CHANGE NOTHING:

DON'T BELIEVE IT WILL CHANGE EVERYTHING

*

# NOTE

THIS CHAPTER HAS BEEN PREPARED FOR TEACHERS WHO HAVE ATTENDED AT LEAST ONE EDUCATIONAL WORKSHOP AND THUS KNOW HOW SUCH WORKSHOPS OPERATE AND ARE FAMILIAR WITH THE EDUCATIONAL HANDBOOK.

*

It is offered to you for use in a wide range of local contexts. This means that any user will always have to remember to make allowance for the cultural, educational and occupational backgrounds of participants. Modifications may therefore be contemplated, worked out, implemented and, above all, evaluated. However, a user who has had no special training in educational science is not advised to introduce significant changes right away. It is better to use the proposed system as it stands and be prepared to amend it in the light of experience, inter alia as a result of "feedback" from participants.

*

# 6

## GLOSSARY
## INDEX

This glossary of technical terms used in educational and psychological measurement is intended primarily for persons with limited training in test and measurement (docimology), rather than for specialists. The terms defined are those most commonly found in test manuals and simple research reports. In the definitions, niceties of usage have sometimes been sacrificed for the sake of brevity, and, it is hoped, clarity.

The terms and definitions included are purely ad hoc, for the purposes of this glossary alone, and they represent only the views of the authors and do not necessarily have any validity outside the context of the handbook. There is not complete uniformity among writers in the measurement field with respect to the usage of certain technical terms; in cases of varying usage, either these variations are noted or the definition offered is the one that the writer judges to represent the "best" usage.

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★ Adapted from Roger T. Lennon, "Test Department" Harcourt, Brace and World Inc. Revised by J.-J. GUILBERT (WHO); G. and L. MASSE, ENSP, Rennes (France); B. PISSARRO, University of Paris (France) and J. C. Chancerel, University of Neuchâtel (Switzerland).

# A

Absolute criteria test -(see p. 457 to 460.)

Affective - Concerning the feelings; affectivity is the combination of acts and tendencies which express the feelings felt towards others; it is situated primarily on the interhuman relationships level. It is often employed to qualify attitudes. The word "affect" is a neologism used by psychologists to designate an affective state (pp. 102, 106, 156-158, 162-166, 324, 326-327).

Aptitude - A combination of abilities and other characteristics, whether inborn or acquired, known or believed to be indicative of an individual's ability to learn in some particular area. Thus, musical aptitude would refer broadly to that combination of physical and mental characteristics, motivational factors and conceivably other characteristics, which is conducive to acquiring proficiency in the musical field. Some exclude motivational factors, from the concept of "aptitude", but the more comprehensive use seems preferable. The layman may think of "aptitude" as referring only to some inborn capacity; the term is no longer so restricted in its psychological or measurement usage.

Arithmetic mean (one of the central tendency values of a distribution) - The arithmetic mean is the sum of the observations divided by the number of observations (p. 462).

Asymmetry - "Characteristic of a distribution where the values are not equally distributed on either side of the mean. In this case: (1) the three central tendency characteristics do not coincide, (2) the standard deviation has no longer any geometric significance in describing the dispersion of the distribution, which is then better expressed by the quantiles (quartiles, deciles, percentiles)" (p. 478).

Attitude - Derived from the latin "actitudo", which indicates a disposition. By analogy, the internal disposition which is shown (internally) in behaviour with respect to persons, events, opinions or theories; it is a relatively constant disposition of feeling towards someone or something (pp. 106, 114, 116, 258-265, 326-332).

# B

Battery of tests - A group of several tests standardized on the same population, so that results on the several tests are comparable. Sometimes this term is wrongly applied to any group of tests administered together, even if they are not standardized on the same subjects.

Behaviour - The total reactions (of an individual) accessible to external observation. Thought and understanding are implicit behaviours which are observable not directly, but solely by inference from other observable behaviours (pp. 2, 7, 106, 108, 116, 163, 258-265, 314, 323).

Bias - "Bias is the result of an incorrect procedure for selecting a sample, so that the sample is not representative of the population from which it is taken."

Bit - Abbreviation of "binary digit". In cybernetics, the basic unit of information.

# C

Coefficient of correlation (r) - A measure of the degree of relationship, or "goingtogetherness" between two sets of measures for the same group of individuals. Two coefficients of correlation are used in psychology, firstly the Pearson (r), developed at the beginning of the century by the British statistician Karl Pearson, and, secondly, Spearman's correlation coefficient ($r_s$). The first is more powerful, but the data observed must be normally distributed and their variances must be homogeneous. Furthermore, the calculation takes longer unless a computer is available. The second is less powerful but does not assume any preliminary condition of the data and is easier to calculate. Unless otherwise specified, "correlation" usually means "coefficient of correlation", which ranges from 0 (showing complete absence of relationship) to 1 (denoting perfect correspondence). It may be either positive or negative so that it ranges from -1 to +1 (see pp. 461-463).

Coefficient of reliability - The coefficient of correlation between two forms of a test, between scores on repeated administration of the same test, or between halves of a test, properly corrected. These three coefficients measure somewhat different aspects of reliability. See, for example, the Kuder-Richardson formula (see pp. 461-463).

Cognitive - Cognitive field: the field of knowledge. The "cognitive faculty is the act of knowing" (see pp. 2, 7, 106, 108, 152-155, 163, 314, 323-324).

Collective test - A test that can be administered to a certain number of persons at the same time (see individual test).

Competence - The ability required to assume certain functions (see pp. 105, 106, 206, 233-235).

Completion item - A test question calling for the completion of a phrase, etc., from which one or more parts have been omitted (see page 423).

Correction for guessing - Reduction in score to allow for guesses, sometimes applied in scoring questions of the true-false or multiple-choice type. This device is intended to discourage guessing and to yield more accurately rankings of examinees in terms of their true knowledge (page 474).

Correlation - Relationship or "going-togetherness", between two scores or measures. The existence of a high correlation between two variables does not necessarily indicate that one has any causal influence on the other (see coefficient of correlation) (see p. 461-463).

Criterion - A standard by which a test may be judged or evaluated; a set of scores, readings, etc., that a test is designed to predict or to correlate with (see validity) (see pp. 146, 148, 165-166, 311-312, 314, 322, 457-460.)

Criterion referenced test -(see pp. 457-460.)

Critical incident technique - (see pp, 111-112).

Cybernetics - The science and technique of information processing; it enables problems to be rapidly solved and implementation to be automatically set off. In education, this corresponds to teaching organized in such a way that the student acquires the knowledge and "know-how" called for by the educational objectives by means of systematically established exercises (programme teaching or teaching machines, for example) and is informed about his progress (see p.105)

## D

Decile - There are nine deciles and they are those values of the variable that divide the distribution studied into 10 equal parts; the fifth decile is the median (see this word); in scoring the first decile denotes the score below which 10% of the scores fall (see p. 478).

Deviation - The amount by which a score differs from some reference value, such as the mean, the norm or the score on some other test.

Diagnostic Test - In education, a test used to "diagnose", that is to locate, specific areas of weakness or strength and to determine the nature of the weaknesses or deficiencies; it yields measures of the components or sub-parts of some larger body of information or skill. Diagnostic achievement tests are most commonly prepared for assessing skills (see p. 316).

Difficulty index - The percentage of some specified group of students who answer an item correctly (see pp. 465, 469-473).

Discrimination index - The discriminating power of an item (see pp. 465, 469-473).

Distractor - Any of the incorrect choices in a multiple-choice question (see p. 482).

Distribution (frequency distribution) - A tabulation of scores from high to low or low to high, showing the number of individuals that obtain each score or fill in each score interval (see p. 467).

Docimology - Neologism suggested by French psychologist H. Pieron to designate the scientific study of test methods (see pages 107, 403).

## E

Education - (see pp. 108-309).

Epidemiological studies - (see pp. 112-113).

Equivalent form - Any of two or more forms of a test that are closely parallel with respect to the nature of the content and the difficulty of the items included, and that will yield very similar average scores and measures of variability for a given group (see p. 461).

Error of measurement - See standard error.

Ethics (professional) - (see p. 259).

Explicit - Stated in a sufficiently clear and precise manner, so as to leave no doubt. ANT: implicit, confused, equivocal, ambiguous, obscure (see pp. 108, 147).

Extrapolation - In general, any process of estimating values of a function beyond the range of available data. As applied to test norms, the process of extending a norm line beyond the limits of actually obtained data, in order to permit interpretation of extreme scores. This extension may be done mathematically by fitting a curve to the obtained data or, as is more common, by less rigorous methods, usually graphic. Considerable judgement on the test maker's part enters into any extrapolation process, which means that extrapolated norm values are likely to be to some extent arbitrary.

## F

Factor - In mental measurement, a hypothetical trait, ability, or component of ability, that underlies and influences performance on two or more tests, and hence causes scores on the test to be correlated. The term "factor" strictly refers to a theoretical variable, derived by a process of factor analysis, from a table of interrelationships among tests; but it is also commonly used to denote the psychological interpretation given to the variable - i.e. the mental trait assumed to be represented by the variable, as verbal ability, numerical ability, etc.

Factor analysis - A group of statistical methods for analysing the intercorrelations among a set of variables (for example, test scores). Factor analysis uncovers factors which explain the common characteristics of and the differences between the examinees and the questions. Factor analysis has contributed to the understanding of the organization or components of intelligence, aptitudes and personality, and it has pointed the way to the development of tests of the several components. "Factor" has no causal meaning here, but is used in its mathematical sense and is not intended to express a causal relationship.

Feedback - An informative reaction to the message of teaching. It is useful, not only as a means of checking, but also as a means of increasing the student's learning activity (see pp. 320-321, 329).

## G

Grade norm - The average score obtained by students of a given level (see p. 466).

## H

Halo effect - An interference effect resulting from the idea the examiner has already formed of a student (previous results) on the basis of his test results (see page 453).

## I

Individual test - A test that can be administered to only one person at a time (see collective test).

Integration - To join parts together to form a consistent whole. Coordination of different learning/teaching activities with a view to the harmonious functioning of the educational process and more effective training of personnel (see pp. 203, 229, 239-250).

Interpolation - In general, any process of estimating intermediate values between two known points. As applied to test norms, it refers to the procedure used in assigning interpreted values to scores between successive limits obtained in the standardization process. In reading norm tables it is necessary at times to interpolate to obtain a norm value for a score between scores given in the table (see p. 478).

Item - A single question or exercise in a test (see p. 465).

Item analysis - The process of evaluating single test items by any of several methods, in particular by determining its difficulty index, discrimination index and often its correlation with some selected criteria (see pp. 465-473).

## K

Kuder-Richardson formulas - Formulas for estimating the reliability of a test from information about the individual items in the test, or from the mean score, standard deviation, and number of items in the test. Because the Kuder-Richardson formulas permit estimation of reliability from a single administration of a test, without it being necessary to divide the test into halves, their use has become common in test development. The Kuder-Richardson formulas are not appropriate for estimating the reliability of speed tests (see page 462).

## L

Learning - (see pp. 106, 117, 151, 201-206, 212-216, 229, 232-235, 258-265, 313.)

## M

Machine-scorable (machine-scored) test - A test which may be scored by means of a machine. In taking tests that are to be scored by machine the examinee records his answers on separate answer sheets. The machine rapidly distinguishes between right and wrong answers and can combine groups of responses in order to yield total or part scores, weighted scores, or corrected scores.

Matching item - Type of multiple-choice item calling for the correct association of data given in one list with those given in a second list. There are several types: simple matching, excluded term matching, causal relationship, quantitative comparison, relative variation (see pp. 431-432).

Median (one of the central tendency values in a distribution) - The median is that value of a variable which divides the series into two equal parts when the data are arranged in increasing or decreasing order. The median corresponds to the second quartile, the fifth decile and the fiftieth percentile. For example, in a group of scores, half of the group lies above the median and the other half below (see p. 478).

Mode (one of the central tendency values of a distribution) - The mode is that value of a variable which occurs most frequently in a distribution (see p. 478).

Multiple response items - Type of multiple-choice item in which two or more of the given choice may be correct and where there is generally a code permitting only one answer to be given on the answer sheet (see p. 430-431).

Multiple-choice question (MCQ) - A test item in which the examinee's task is to choose the correct or best answer from several given answers or options (distractors) (see p. 314-315, 418-419, 428-440).

# N

N - The symbol commonly used to represent the number of cases in a distribution, study, etc.

Norm referenced test -(see p.457-460.)

Normal or GAUSS distribution - A distribution of scores or measures that in graphic form has a bell-shaped appearance. This distribution, termed the normal distribution, which is an incomplete and in any case misleading designation in the human sciences, particularly in psychology, is a theoretical distribution to which a certain number of observed distributions conform (the figure on page 478 is an example). In a normal distribution the values are symmetrically distributed about the mean; the mean, mode and median are merged because of this symmetry. There is a concentration of values around the mean, with a decrease in frequency the further one departs from the mean.

A certain number of observed distributions follow the normal distribution law, and certain observed distributions which are not normal can sometimes be made normal distributions by transforming the variable, which facilitates certain statistical treatments (variance analysis and correlation calculations in particular).

Moreover, the normal distribution is useful in sampling judgement, for the sampling distributions of various parameters, the mean, for example, or the standard deviation, follow the normal distribution law if the sample size is adequate. However, care must be taken not to confuse the observed distributions with a sample or a population and the sampling distributions, which are theoretical distributions making possible to predict sampling fluctuations of relative frequencies, or of parameters such as the mean or standard deviation (see p. 478).

Norms - Statistics that describe the performance of a group in given tests, e.g. of students of various grades in a group in a standardized test. Norms are often representative of some larger population as of students and the country as a whole. They are not to be regarded as standards, or as desirable levels of attainment. Grade, age and percentile are the most common types of norm (see pp. 457, 478).

# O

Objective test - A test in the scoring of which there is no possibility of differences of opinion among scorers as to whether responses are to be scored right or wrong. It is contrasted with tests such as the traditional essay examination to which different scorers may assign different scores, ratings or grades; e.g. MCQ, programmed examination (see pp. 417-418-426-450).

Oral examination (see p. 416)

# P

Percentile - There are 99 percentiles and they are those values of the variable which divide the distribution series into 100 equal parts; the fiftieth percentile is the median (see this word). To each percentile there corresponds a value of the variable such that the percentage of values observed below that value is indicated by the rank of the percentile: thus, in scoring the fifteenth percentile denotes the score below which 15% of the scores fall (see p. 478

Percentile rank - Percentage of scores in distribution equal to or lower than the score corresponding to the given rank (see p. 478).

Performance (or control) test - A test which measures to what extent a student has "achieved" something - learned certain data or mastered certain techniques following a given course of teaching, a practical test requiring motor or manual response on the part of the examinee. Generally, but not always, it involves manipulation of concrete equipment or materials. The term is also used in another sense to denote a test that is actually a work-sample. In this sense it may include paper and pencil tests, such as, for example, a test in statistical calculation where no materials other than paper and pencil are required, but where the test response is identical with the behaviour about which information is desired (see p. 108, 147-14

Personality test - A test intended to measure one or more of the non-intellectual aspects of an individual's mental or psychological make-up. Personality tests include the so-called personality inventories or adjustment inventories (e.g. Heston Personal Adjustment Inventory, Bernreuter Personality Inventory, Bell Adjustment Inventory) which seek to measure a person's status on character traits (sociability, introversion, etc.) by means of self-descriptive responses to a series of questions; rating scales (e.g. Haggerty-Olson Wickman Behaviour Rating Schedules) which call for rating by oneself or another of the extent to which an individual possesses certain characteristics; situation tests in which the individual's behaviour in simulated life-like situations is observed by one or more judges, and evaluated with reference to various personality traits; and opinion or attitude inventories (e.g. Allport-Vernon Study of Values). The results are particularly difficult to interpret.

Practice effect - The influence of previous experience with a test on a later administration of the same test or a similar test. Usually there is an increase in the score on the second testing, attributed to increased familiarity with the directions, kinds of question, etc. Practice effect is greater when the interval between testings is short, when the materials in the two tests are very similar, and when the initial test is a relatively novel experience for the subjects (see p. 330).

Prerequisite level test - In education, a test that measures the extent to which an individual has acquired a certain level of competence needed to undertake some new learning activity successfully. For example, a prerequisite level test in pharmacology shows the extent to which a student has reached a level whereby he may profitably begin a course on therapeutics. Also called readiness test (see pp. 138, 407-409).

Pre-test - Test which shows to what extent a student has acquired certain knowledge before the commencement of the corresponding teaching.

Prognosis (prognostic) test - A test used to predict future success or failure in a specific field or subject (see pp. 9, 407-409).

Programme - Plan laid down in advance fixing the order or the timetable of a group of educational activities (see pp. 6-7, 105-107, 114-117, 201-266).

Programmed learning - Method of instruction consisting of a system of graduated questions with an immediate check of the answer; the right answer is needed in order to answer the following question correctly. Such teaching can be automated by using, for example, teaching machines or computers (see p. 221).

Projective technique - A method of personality study in which the subject responds as he chooses to a series of stimuli such as ink-blots, pictures, unfinished sentences, etc. So called because of the assumption that under this free response condition the subject "projects" into his responses manifestations of personality characteristics and organization that can be interpreted to yield a description of his basic personality structure. The Rorschach (ink-blot) Technique and the Murray Thematic Apperception Test are the most commonly used projective methods.

Psychomotor - Referring simultaneously to sensibility, sensation and motricity. Synonym: sensory-motor (see pp. 102, 106, 159-165, 324).

## Q

Quantile (parameter dispersion of data with range and standard deviation) - The main quantiles are the quartiles, the deciles and the percentiles (see p. 478).

Quartile - One of three points which represent values of the variable dividing the series studied into four equal groups. The second quartile is the median (see this word) in a group of scores, the first quartile represents that score below which lie 25% of the scores (see p. 478).

## R

r - See coefficient of correlation.

Random sample - A sample of the members of a population drawn in such a way that every member of the population has an equal chance of being included. This method precludes any bias or selection. The purpose of using the method is, of course, to obtain a fairly "representative" sample of the total population, so that the sample findings may be generalized to the whole population. Random sampling has also the following advantage: in accordance with the calculus of probabilities, formulae are available for predicting the relative frequencies or parameters, such as the mean or standard deviation of the sample, from the true values of the relative frequencies or parameters in the total population; conversely, the limits within which are very probably situated the relative frequencies or parameters of the population from which the sample is drawn can be estimated from the relative frequencies or parameters observed with the sample. There are various methods, in particular random number tables, for drawing such a sample in practice.

Range - The difference between lowest and highest scores obtained in a test administered to a given group (see p. 467).

Rank-ordering - The process of arranging the students in order of merit as determined by scores obtained in one or more tests (see p. 467).

Raw score - The first quantitative result obtained in scoring a test (for example, the number of right answers, number of errors, or similar, direct, unconverted, uninterpreted measures) (see pp. 466-467).

Recall item - An item that requires the examinee to supply the correct answer from memory. This item differs from the recognition item in which he need only identify the correct answer. For example, "Claude Bernard published the 'Introduction to the Study of Experimental Medicine' in . . .?" is a recall item, whereas "Claude Bernard published the 'Introduction to the Study of Experimental Medicine' in A) 1785, B) 1815, C) 1865, D) 1905" is a recognition item in the form of a multiple-choice question (see p. 423).

Recognition item - An item requiring the examinee to recognize or select the correct answer from among two or more given answers, e.g. in a multiple-choice question (see that term).

Relative criteria test (see p.457-460)

Relevance - (see pp. 6-7, 105-114, 123, 138-139, 143, 173-174, 219, 232-235, 253, 302, 315, 335-339, 347, 404, 452, 485).

Reliability - The extent to which a test is consistent in measuring whatever it has to measure; dependability, stability, and relative freedom from errors of measurement. Reliability is usually estimated by some form of correlation coefficient (see reliability coefficient, standard error of measurement).(see pp. 302, 312, 334-339, 461-463).

Representative sample - A sample that corresponds to or matches the population of which it is a sample with respect to characteristics important for the purposes of the investigation.

## S

Scale - Continuous series of programmed values in which data are situated in order to assess them with respect to a whole (see pp. 326-332, 452-453).

Sensory-motor - See psychomotor.

Sociometry - Measurement of the interpersonal relationships prevailing among the members of a group. By means of sociometric devices, e.g. the sociogram, an attempt is made to discover the patterns of choice and rejection among the individuals making up the group (by identifying those chosen most often as friends or leaders, and those rejected by others), to see how the group subdivides, etc.

Spearman-Brown formula - A formula giving the relationship between the reliability of a test and its length. The formula permits estimation of the reliability of a test lengthened or shortened by any amount, from the known reliability of a test of specified length. Its most common application is in the estimation of reliability of an entire test from the correlation between the two halves of the test (split-half reliability) (see page 462).

Specification tables -(see pages 106, 203, 255-257, 454-455).

Stanine - One of the steps in a nine-point scale of normalized standard scores. The Stanine scale (short for standard-nine) has values ranging from 1 to 9 with a mean of 5 and a standard deviation of 2 (see p. 478).

Standard deviation - A measure of the dispersion of a set of data. The more the data cluster around the mean, the smaller the standard deviation. The standard deviation of an observed distribution is useful in particular as a geometrical measure of the dispersion when the distribution is symmetrical and, more especially, when the distribution follows the normal distribution law (page 478). In the latter case, the proportion of observations contained in a given interval, around the mean, expressed in "standard deviation" units, is mathematically defined; in particular, 68% of observations are found within an interval of one standard deviation on either side of the mean, 95% within an interval of two standard deviations, and more than 99% (99.74% to be precise) within an interval of three standard deviations. If the distribution is asymmetrical, the standard deviation is still a valuable measure of dispersion but is no longer of geometrical value for determining these intervals. On the other hand, the variance (square of the standard deviation) is always used in this case to make a certain number of estimates concerning the form and spread of the sampling distribution (and no longer of the observed distribution) (see pp. 461-463, 478).

Standard error - The standard error is the standard deviation of a sampling distribution. The use of the standard error is very important when the sampling distribution follows the normal distribution law (i.e. when the sample is drawn at random and is sufficiently large: for example, $n > 30$ in the case of the sampling distribution of a mean) (see pp. 461-463).

**Standard score** - A general term referring to any of a variety of corrected scores, in terms of which raw scores may be expressed for reason of convenience, comparability, ease of interpretation, etc.

The simplest type of standard score is that which expresses the deviation of an individual's raw score from the average score of his group in relation to the standard deviation of the scores of the group. Thus:

$$\text{Standard score } (z) = \frac{\text{raw score } (X) - \text{mean } (M)}{\text{standard deviation } (SD)}$$

Standard scores having the same mean or standard deviation may be obtained from this ratio. Such standard scores do not affect the relative standing of the individuals in the group nor change the shape of the original distribution (see conversion chart, page 478).

### T

Task analysis (see p. 112).

Teaching (see pp. 205-210).

Taxonomy - (see pp. 151-163, 314-315)

### V

Validity -(see pp. 302, 312, 329, 335-339).

### W

Workshop - (see pp. 501-549).

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# RECAPITULATORY ANSWER SHEET

## POST TEST[1]

### CHAPTER I

| | | | | | |
|---|---|---|---|---|---|
| 1 | A | B | C | D | E |
| 2 | A | B | C | D | E |
| 3 | A | B | C | D | E |
| 4 | A | B | C | D | E |
| 5 | A | B | C | D | E |
| 6 | A | B | C | D | E |
| 7 | A | B | C | D | E |
| 8 | A | B | C | D | E |
| 9 | A | B | C | D | E |
| 10 | A | B | C | D | E |
| 11 | A | B | C | D | E |
| 12 | A | B | C | D | E |
| 13 | A | B | C | D | E |
| 14 | A | B | C | D | E |
| 15 | A | B | C | D | E |
| 16 | A | B | C | D | E |
| 17 | A | B | C | D | E |
| 18 | A | B | C | D | E |
| 19 | A | B | C | D | E |
| 20 | A | B | C | D | E |

### CHAPTER II

| | | | | | |
|---|---|---|---|---|---|
| 1 | A | B | C | D | E |
| 2 | T | | | F | |
| 3 | T | | | F | |
| 4 | T | | | F | |
| 5 | T | | | F | |
| 6 | T | | | F | |
| 7 | T | | | F | |
| 8 | A | B | C | D | E |
| 9 | A | B | C | D | E |
| 10 | A | B | C | D | E |
| 11 | A | B | C | D | |
| 12 | A | B | C | D | |
| 13 | A | B | C | D | E |
| 14 | A | B | C | | |
| 15 | A | B | C | | |
| 16 | A | B | C | | |
| 17 | A | B | C | | |
| 18 | T | | | F | |
| 19 | T | | | F | |
| 20 | T | | | F | |

### CHAPTER III

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| 1 | A | B | C | D | E |
| 2 | A | B | C | D | E |

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| 4 | A | B | C | D | E |

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| 6 | A | B | C | D | |
| 7 | A | B | C | D | |
| 8 | A | B | C | D | |
| 9 | A | B | C | D | |
| 10 | A | B | C | D | |
| 11 | A | B | C | D | E |
| 12 | A | B | C | D | E |
| 13 | A | B | C | D | E |
| 14 | A | B | C | D | E |
| 15 | A | B | C | D | E |
| 16 | A | B | C | D | E |
| 17 | S | | | SF | |
| 18 | S | | | SF | |
| 19 | S | | | SF | |
| 20 | S | | | SF | |
| 21 | S | | | SF | |
| 22 | S | | | SF | |
| 23 | S | | | SF | |
| 24 | S | | | SF | |
| 25 | A | B | C | D | E |

### CHAPTER IV

| | | | | | |
|---|---|---|---|---|---|
| 1 | A | B | C | D | E |
| 2 | A | B | C | D | E |
| 3 | A | B | C | D | E |
| 4 | A | B | C | D | E |
| 5 | A | B | C | D | E |
| 6 | A | B | C | D | E |
| 7 | A | B | C | D | |
| 8 | A | B | C | D | |
| 9 | A | B | C | D | E |
| 10 | A | B | C | D | |
| 11 | A | B | C | D | |
| 12 | A | B | C | D | |
| 13 | A | B | C | D | |
| 14 | A | B | C | D | |
| 15 | A | B | C | D | |
| 16 | A | B | C | D | E |
| 17 | A | B | C | D | |
| 18 | A | B | C | D | E |
| 19 | T | | | F | |
| 20 | T | | | F | |

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[1] __Note__: The questions are set on pages 167 to 170, 269 to 271, 344 to 346 and 479 to 482.

## CONTROL YOUR ANSWERS[1]

### to the Post Test (page 517)

### CHAPTER I

1 A ☒ C D E
2 A B C ☒ E
3 A B C D ☒
4 A ☒ C D E
5 A B C ☒ E
6 A B ☒ D E
7 A B C ☒ E
8 A B ☒ D E
9 A ☒ C D E
10 A B C ☒ E
11 ☒ B C D E
12 A B C D ☒
13 A ☒ C D E
14 A B ☒ D E
15 A B ☒ D E
16 A B C ☒ E
17 ☒ B C D E
18 A B C D ☒
19 ☒ B C D E
20 A B C D ☒

### CHAPTER II

1 A ☒ C D E
2 ☒ F
3 T ☒
4 ☒ F
5 T ☒
6 ☒ F
7 ☒ F
8 ☒ B C D E
9 A B C ☒ E
10 A B C ☒ E
11 A B ☒ D
12 A ☒ C D
13 A B C D ☒
14 A ☒ C
15 ☒ B C
16 A ☒ C
17 A B ☒
18 T ☒
19 ☒ F
20 T ☒

### CHAPTER III

1 A ☒ C D E
2 A B C D ☒
3 to facilitate decision making by those responsible for an educational system...
4 A B C D ☒
5 1) define objectives including criteria
2) construct instruments
3) interpret data
4) make judgement
6 ☒ B C D
7 A ☒ C D
8 A B ☒ D
9 A ☒ C D
10 A B ☒ D
11 A B C ☒ E
12 A ☒ C D E
13 A B ☒ D E
14 A B C ☒ E
15 A ☒ C D E
16 ☒ B C D E
17 S ☒
18 S ☒
19 S ☒
20 ☒ SF
21 ☒ SF
22 S ☒
23 S ☒
24 ☒ SF
25 A B C D ☒

### CHAPTER IV

1 A B C ☒ E
2 A B ☒ D E
3 ☒ B C D E
4 A B ☒ D E
5 A B C ☒ E
6 A B C ☒ E
7 A ☒ C D
8 A B C ☒
9 A ☒ C D E
10 A B ☒ D
11 A B C ☒
12 A B C ☒
13 ☒ B C D
14 A B C ☒
15 A ☒ C D
16 ☒ B C D E
17 A ☒ C D
18 A B C ☒ E
19 T ☒
20 ☒ F

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[1] Recheck on pages 172,273, 348, 484.

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1. Health needs and resources, organization of health services, analysis of tasks and functions.
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7. Evaluation by students.

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[1] Note, however, that many of these references concern several fields.

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